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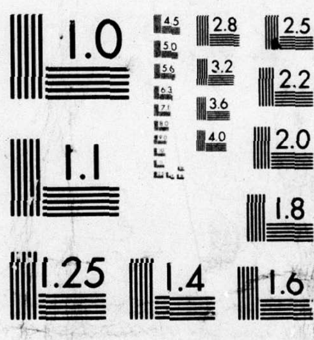
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GENESEE RIVER BASIN

COMPREHENSIVE

STUDY OF

WATER AND RELATED LAND RESOURCES.

Volume IV.

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HYDROLOGY.

Appendix F.

Flood Control.

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GENESEE RIVER BASIN

COMPREHENSIVE

STUDY OF

WATER AND RELATED LAND RESOURCES

APPENDIX E

HYDROLOGY

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HYDROLOGY

INTRODUCTION

1. SCOPE

a. Presented in this appendix are hydrologic and hydraulic data pertinent to the comprehensive study of water and Related Land Resources for the Genesee River Basin.

b. The hydrologic aspects of a variety of water resources problems are analyzed, including unit hydrographs and flood peak frequencies, for flood control studies; flow duration studies for power utilization; and low flow duration studies and yield estimates for studies involving water supply and water quality control.

c. Both the geographic and temporal distribution of water have been analyzed, with the purpose of determining existing problems and providing a basis for anticipating future problems.

d. The project formulations presented in other sections of this report are based on the hydrologic and hydraulic data presented in this appendix.

e. The Technical Hydrology Attachment provides a discussion of procedures used in determining the hydrologic data contained in Appendix E, and documentation of basic data used to develop more complex information.

2. DESCRIPTION OF THE BASIN

a. The Genesee River Basin is roughly elliptical in shape, with a north-south major axis of approximately 100 miles and a maximum width of about 40 miles. The basin lies generally between 41°45' and 43°15' North Latitude and between 77°25' and 78°25' West Longitude. The total drainage area of the basin is about 2479 square miles of which about 1077 square miles lie upstream of Mount Morris Dam, built and operated for flood control by the Corps of Engineers. Plates E1 and E2 show maps of the basin.

b. The Genesee River has a total length of about 157 river miles. It rises in the Allegheny Mountains in Potter County, Pennsylvania, at an elevation of about 2500 feet, flows generally northwest to river mile 106 near Houghton and then generally northeast to its mouth on Lake Ontario, at an elevation of approximately 247 feet.

c. The topography of the southern portion of the basin (hereafter referred to as the Upper Basin), upstream of Mount Morris Dam, is steep and rugged, while the northern portion of the basin (the Lower Basin) is gently rolling. Geologically, the Upper Basin is in a stage of young maturity, while the Lower Basin has reached a geologically old stage with much meandering, a wide flood plain, and numerous oxbows. In Letchworth State Park, just upstream of Mount Morris Dam, the river drops from an elevation of about 1080 feet to 768 feet, over three successive falls, flowing through a deep gorge cut in rock. It then flows through narrow valleys and gorges to enter the broad Lower Genesee Valley at the village of Mount Morris. From this point to Rochester, the valleys are flat alluvial plains up to three miles wide and were subject to frequent flooding before the construction of Mount Morris Dam. At Rochester, the river drops over three falls from elevation 513 to 247 feet, the elevation of Lake Ontario. Between Letchworth State Park and the headwaters, the average stream slope is 8.9 feet per mile, while between Rochester and Mount Morris, the average stream slope is 0.8 feet per mile.

d. The largest tributary of the Genesee River is Canaseraga Creek. It has a drainage area of 334 square miles and joins the Genesee River near Jones Bridge, just downstream of Mount Morris. In many respects, it is a miniature duplicate of the larger Genesee Basin, in that its upper reaches, above the village of Dansville, are steep and rugged, while its lower valley is a flat alluvial plain which is frequently flooded for durations of several months at a time. Above Dansville, the main stem has a slope of about 40 feet per mile while from Dansville to its mouth, it has a slope of about 3 feet per mile. The Canaseraga Creek Basin is roughly square in shape, about 20 miles on a side. The main stem, which rises at about elevation 1900, has a length of 42 river miles and joins the Genesee River downstream of Mount Morris at river mile 62, at an elevation of about 548 feet.

e. Other tributaries of the Genesee have a wide range in size and topographic characteristics. For example, Angelica Creek, in the Upper Basin, has a drainage area of 85 square miles and is topographically rugged, with a main stream slope of 38 feet per mile. Black Creek, in the Lower Basin, has a drainage area of 214 square miles. Its basin is relatively level and marshy with a main stream slope of 6.5 feet per mile. Plate E3 shows profiles of the Genesee River and some of its major tributaries. Drainage areas for sub-watersheds throughout the Genesee basin, published by the U. S. Department of the Interior - Geological Survey, are listed in the Hydrology attachment. If discrepancies arise between drainage areas stated in the text and drainage areas given in table E29A, the values given in the table should govern.

3. ARTIFICIAL CONTROLS

a. There are numerous artificial controls in the Genesee River Basin. The major one is Mount Morris Dam and Reservoir on which construction was begun in March 1948 and completed by June 1952. It is a concrete gravity dam with an ungated ogee spillway 550 feet long, with a crest at an elevation of 760 feet, 175 feet above the steambed and is operated solely for flood control. The dam has an overall length of 1028 feet and a maximum height of 215 feet and is provided with nine 5 x 7-foot rectangular outlet conduits, each controlled by a vertical hydraulic slide gate. The reservoir is contained in the deep, narrow valley between Mount Morris and the Lower Portage falls. At the top of flood control pool, the reservoir has a length of about 17 miles and a maximum width of about 1/2 mile. The total storage at the top of flood control (spillway crest) is 337,400 acre-feet, of which 610 acre-feet are dead storage, leaving 336,790 acre-feet or 5.86 inches of storage for flood control. The reservoir is regulated for flood control most frequently in the winter and spring months and has resulted in significant benefits in the Lower Basin.

b. In addition to Mount Morris Dam, other artificial controls in the Genesee Basin include the following:

(1) A series of run-of-river structures for hydroelectric power, developed in the falls reaches at Rochester by the Rochester Gas and Electric Company. Run-of-river structures are those that on the basis of the natural flow of the river utilize little or no storage capacity.

(2) A State-operated gated dam in Rochester for regulation of the elevation of the New York State Barge Canal, which crosses the Genesee River at grade just upstream of Rochester. Its elevation is maintained at approximately 513 feet during the navigation season, and it is provided with guard gates on either side of the river to prevent high flows from entering the canal.

(3) A dam and reservoir, operated by the Rochester Gas and Electric Company, on Caneadea Creek, an Upper Basin tributary which enters the Genesee at about river mile 108 on the main stem. Power is not produced at this dam, its purpose being to augment low flows downstream.

(4) A dam on Hemlock Lake, in the Honeoye Creek basin, operated by the City of Rochester, to provide water supply to that city.

(5) A dam on Conesus Lake outlet to maintain adequate lake levels for recreation on that lake.

(6) A dam on the Genesee River, just below Mount Morris, operated by Rochester Gas and Electric Company for power. It has an uncontrolled concrete spillway 264 feet in length with its crest at 580 feet. Flashboards on the crest provide an additional three feet of surcharge. The plant is basically run-of-river, and releases from the Corps Mount Morris Dam are held at or above 300 cfs when natural flows permit, to provide flow for the R.G. & E. Dam.

(7) A concrete arch type dam on Wiscoy Creek, 3 miles upstream of the Genesee River. This dam provides storage and part of the head for a Rochester Gas and Electric power development at Wiscoy.

CLIMATOLOGY

4. THE CLIMATE OF THE GENESEE VALLEY

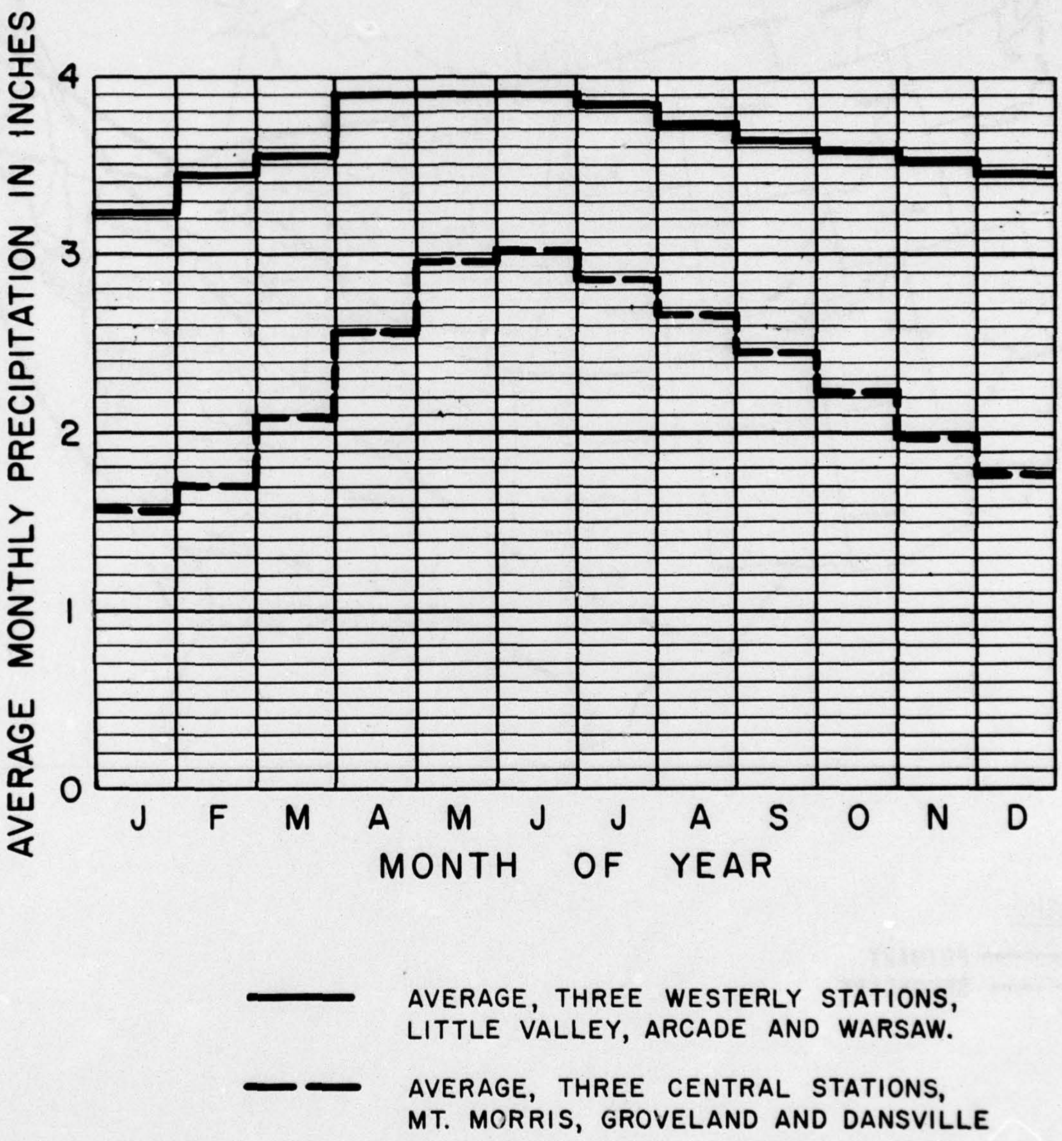
The climate of the Genesee Valley is generally that of the humid or forest climate which prevails over most of the United States east of the Mississippi River. Thornthwaite[1] has devised a classification of climates based largely on considerations of the residual amount of precipitation available for plant growth, after losses due to evaporation and transpiration. In these terms, the Genesee Valley is similar in nature to much of Ohio, the southern part of Indiana, and much of the Ohio River valley. Compared to the Alleghenies, it has less moisture available, and considerably less than the higher elevations. Despite the relatively small size of the Genesee Valley, rather large temperature and precipitation differences exist from one community to another. Data from this section were collected by the U. S. Weather Bureau, and tabulated in its official publications "Climatological Data," for New York and Pennsylvania.

5. PRECIPITATION

a. General.

Precipitation distribution was studied for periods of May-October and November-April and on a monthly basis. These periods make possible a separation of precipitation into rain and snow regimes, and also relate precipitation to the recharge runoff cycle of winter, and the period of deficient rainfall and dryness in summer. Also, the separation of precipitation into these two periods provides some opportunity of examining the contribution of Lake Erie snowfall to the Genesee Valley precipitation pattern.

1 The publication by Thornthwaite is further described in the bibliography following this text. Each time an author is discussed in the text it is noted by a superscript which is referenced in the bibliography.



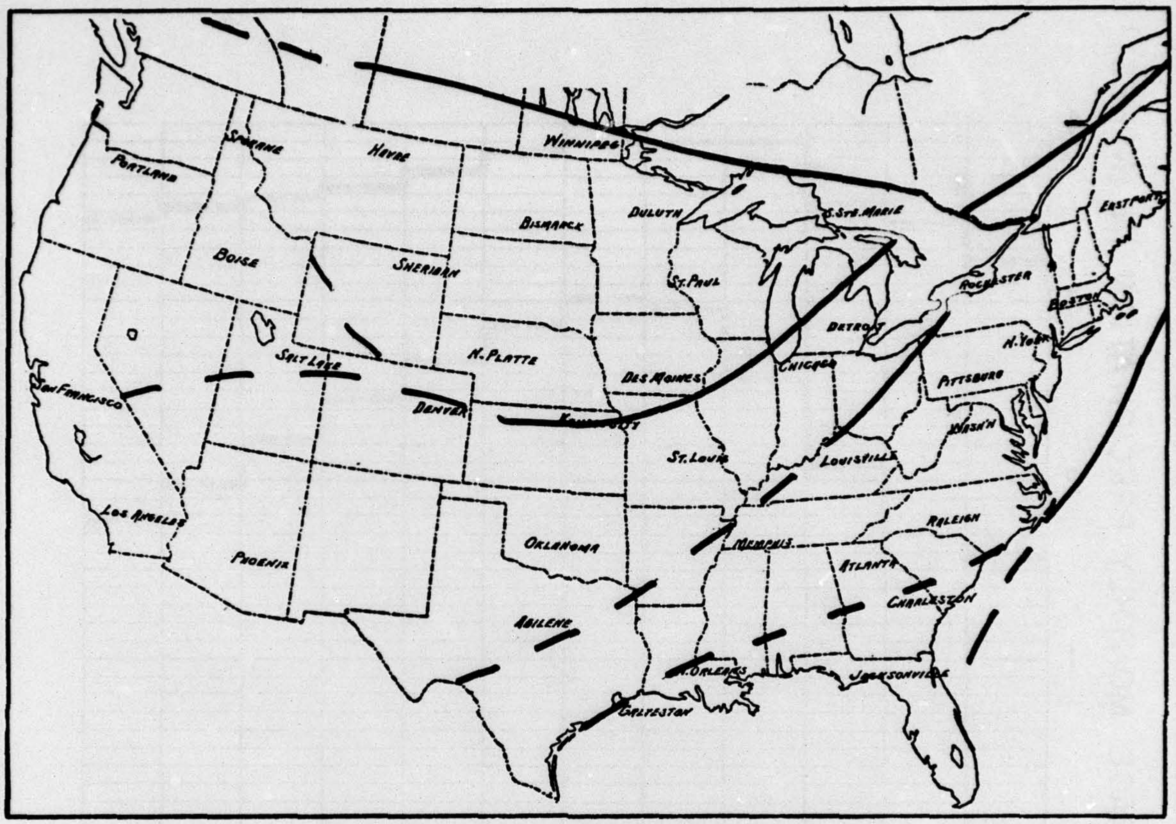
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

AVERAGE MONTHLY PRECIPITATION

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E1



LEGEND:

PRIMARY

SECONDARY

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STORM TRACKS
MONTH OF JANUARY

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

Figure E2

b. Annual precipitation.

The sharp differences in precipitation from one area of the valley to another can be seen quite readily in plate E4. On the western rim, at Warsaw, the total is approximately 40 inches a year, while only 15 miles to the east, near Mt. Morris, the amount is reduced to 26 inches. Similarly reduced values are seen at other points in the central and northern part of the valley. Thus, much of the Genesee Valley represents one of the driest parts of New York State, receiving only about half the precipitation falling in the area east of Lake Ontario, and less than half that normally available to the Catskills. Although amounts are not the same, the general pattern of distribution of precipitation is similar in both the winter and summer periods. Figure E1 shows average precipitation totals for each month for Mt. Morris, Groveland and Dansville, indicated by the dashed line, and the same for Warsaw, Arcade and Little Valley. The former represent the driest portion of the valley, and the latter the area of heaviest wintertime precipitation. The pattern for the stations in the interior of the valley displays the characteristic summertime maximum, while the stations near the western rim show a more uniform pattern with seasons, with snowfall from Lake Erie bolstering the wintertime amount. For the western stations there is a range of about two-thirds of an inch in monthly amounts, while the interior stations show a range of about an inch and a half.

c. Wintertime precipitation.

Although most of the wintertime precipitation occurs as snow, the Genesee Valley also receives a significant amount from cold-season rain, resulting from vigorous northward movements of warm air into the Lower Lakes and northern Alleghenies. In most cases, this precipitation results from the interaction of cold and warm air at some distance from storm centers. A study of principal storm tracks by Klein[2] has shown that the Genesee Valley during the November-April period is affected by two main storm paths - one just offshore from and parallel to the Atlantic coastline, and the other extending from southwest to northeast through the central part of the Great Lakes, well to the northwest of the Genesee Valley. The primary and secondary storm tracts for the month of January for the eastern portion of the United States are shown on figure E2 Storm centers moving through the valley are considerably less numerous than in these two areas, and average about one storm center per month. As mentioned earlier, another significant source of wintertime moisture is snow showers generated over Lake Erie which then move over the western plateau area of Western New York and then across the Genesee Valley. A study of these lake-effect storms by Rothenberg[3] shows that, for a station even as far removed from Lake Erie as Rochester, the highest probability for snow shower activity in significant amounts occurs with winds that pass near Toledo and then the length of Lake Erie. The next most probable wind trajectory to result in snow showers for the northern end

of the valley passes across upper Michigan, near Sault Ste. Marie, and then across the western end of Lake Ontario and into the Valley. Heavy snowfall from lake-effect storms usually diminishes rather abruptly as it reaches the western edge of the Genesee Valley, where the terrain slopes downward to the east. Thus, heavy snowfall can usually occur eastward from Lake Erie to near Batavia and Warsaw, then diminish sharply in amount from there eastward. On rare occasions, however, radar has shown narrow streaks of heavy snow extending eastward across the valley in the vicinity of Mt. Morris and as far east as Syracuse. The phenomenon of lake-effect snowfall has not been studied closely, and reasons for the sudden decrease in snow amounts are not well know. The sudden decrease in snowfall amounts is seen in the distribution of wintertime precipitation, plate E5. An approach to snowfall intensity-frequency relationships for at least the lower elevations of the Valley is found in a statistical analysis by Williams[5], shown in table E1.

TABLE E1. - 24-hour snowfall ranges for indicated return periods, in inches, at Rochester, N. Y.

Return Period (years)	2	10	20	100	Maximum Probable
Annual	8-10	12-17	13-19	16-25	19-33
November	2-4	6-10	7-13	10-18	14-26
December	3-5	6-10	8-12	10-17	13-23
January	4-6	7-10	8-11	10-15	12-20
February	5-7	9-14	10-16	13-22	17-30
March	4-7	9-14	10-17	14-24	19-33
April	1-2	3-5	3-6	5-9	7-13

d. Summertime precipitation.

Averages for the period May through October, plate E6, continue to show largest amounts in the high ground to the west of the Valley, and at the stations on the western edge of the Valley itself. Although no specific study has been made, work done with 24-hour totals and storm totals collected during the movement of general storms through the northeast indicate little difference that can be attributed to topography. It is thought, then that the differences noted in plate E6 come about mainly in shower-thunderstorm type situations. It is commonly

observed that radar echoes of convective showers form first in the area south of Buffalo and then move into the Valley from this point. Possible causes might be differential heating of sun-facing slopes in initiating convection, and differences in speed of storm movement due to terrain. Also, the triggering effect due to orographic lifting of moist air on encountering the first high ground may bring heaviest rainfall over the western plateau, with less rain downwind as the storm dissipates. During summer months the principal storm tracks are well to the north of the Lower Great Lakes, in Canada, with only secondary centers in evidence off the Atlantic coast. There are, on the average, only four centers that move through the area of the Genesee Valley in the May - October period.

6. TEMPERATURE

The average annual temperatures across the Genesee Valley are fairly uniform, generally within the range of 45-48 degrees. The low averages are in the southern part of the basin, due mostly to the cooler air normally encountered at higher elevations. There are rather large nighttime temperature differences between the Lower and Upper basins, on those nights when cloudiness remains over the northern end of the Valley due to the nearness of Lake Ontario but with skies remaining clear in the central and southern portions. As a comparison, Angelica has reported temperatures of 32 degrees or lower in each of the 12 months while the lowest temperature for the month of July in Rochester is 42 degrees. Plate E7 shows the temperature extreme and mean annual temperatures for several stations in the Genesee Basin.

7. DROUGHT

As used in this appendix, the term "drought" will mean a lack of rainfall (and hence runoff) so great and extended as to injuriously affect the plant and animal life of a region, and to deplete water supplies for agricultural, municipal, and industrial uses in a region where rainfall is normally sufficient for such purposes. Numerous approaches have been made to the problem of relating periods of dry weather to the effect of such dryness on vegetation, and to comparing one dry period with another as to length, severity, etc. In this connection, climatological records have been kept of the number of consecutive days without rain, or without rain of a specified amount, and the departure of rainfall for a certain period from normal. As mentioned earlier, Thornthwaite has studied the climate of areas from the standpoint of the potential net gain or loss of moisture for plant use as the seasons progress. As mentioned earlier, much of the Genesee Valley constitutes one of the driest areas of the state, while at the same time having temperatures equal to or higher than other summertime readings in the state. Thornthwaite's system of computing potential evapotranspiration, when used with normal temperature and precipitation values for the Genesee

Valley, indicate a summertime deficiency of rainfall as a normal occurrence, and with the deficiency extending through the upper four inches of soil as a normal occurrence for some of the summer period. For Rochester, the period of greatest deficiency normally extends from the last week of July through September. The primary and secondary storm tracks for the month of July for the eastern portion of the United States are shown on figure E3.

8. NOTABLE STORMS

a. General.

Floods on the Genesee River occur most frequently in the spring when snowmelt or rainfall or a combination of the two produce heavy runoff. The flood producing storms for which meteorologic data are available are listed in table E2 and discussed in the following paragraphs. Only those storms for which meteorologic data are available are discussed here. Large floods of record are discussed in paragraph E16.

TABLE E2. - Storms of record

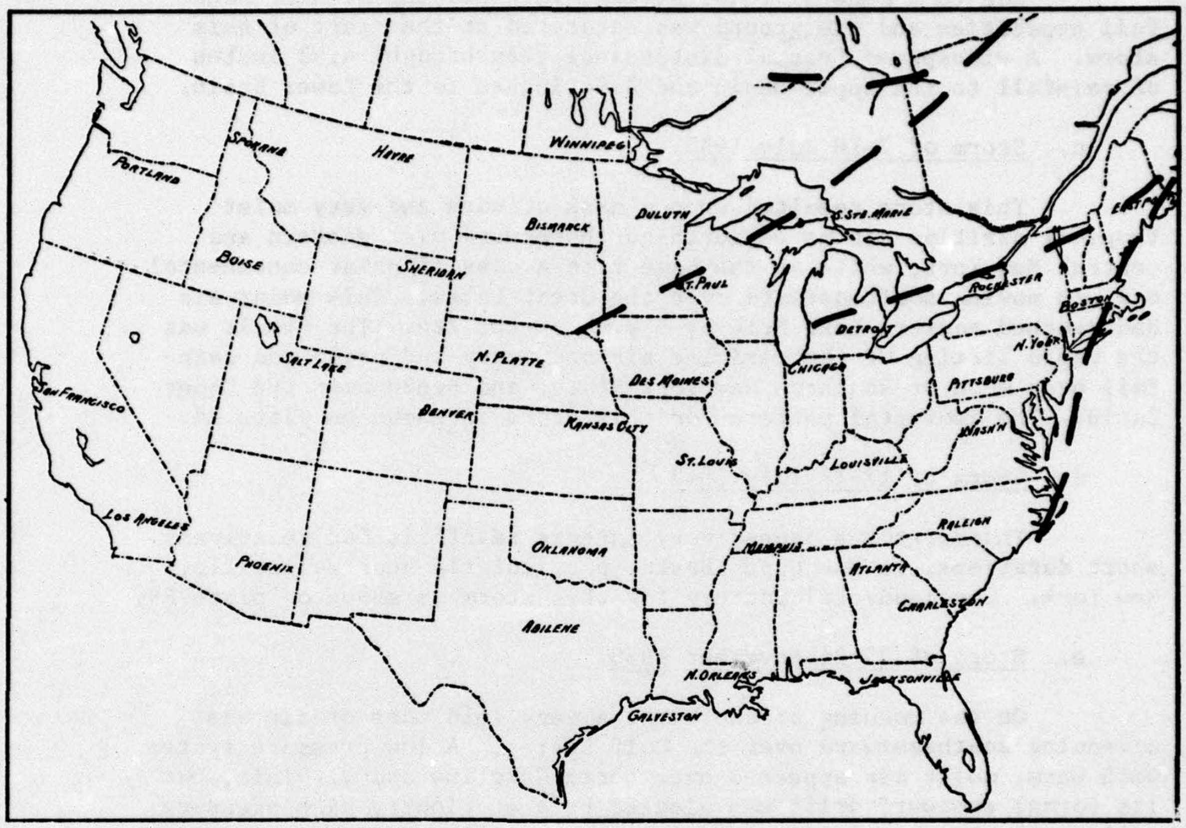
A. Upper Basin.

Storm period	Average precipitation (inches)
23-27 March 1913	4.93
7-10 July 1935	5.86
17-18 July 1942	3.83
24-25 Nov. 1950	2.24
6-10 March 1956	3.20+
24-26 April 1961	2.47

B. Lower Basin.

Storm Period	Average precipitation (inches)
23-27 March 1913	3.94
6-10 March 1956	3.20+
24-26 April 1961	2.25

+ Snowmelt plus rainfall



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GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STORM TRACKS
MONTH OF JULY

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E3

b. Storm of 23-27 March 1913.

Due to a general thaw, streams were flowing at near bank-full capacities and the ground was saturated at the start of this storm. A widespread frontal disturbance then brought 4.93 inches of rainfall to the Upper Basin and 3.94 inches to the Lower Basin.

c. Storm of 7-10 July 1935.

This storm resulted when a mass of warm and very moist tropical maritime air moved north-northwestward over eastern and central New York, while at the same time a mass of polar continental air was moving southeastward over the Great Lakes. This polar air had reached eastern Lake Erie by 8 p.m. of the 7th. The result was the rapid lifting of the maritime air and heavy and prolonged rainfall over much of southern New York State, and hence over the Upper Basin. The isohyetal pattern for this storm is shown on plate E8.

d. Storm of 17-18 July 1942.

Thunderstorms caused very intense rainfalls for relatively short durations, in the Upper Basin, particularly near Wellsville, New York. The isohyetal pattern for this storm is shown on plate E9.

e. Storm of 25-26 November 1950.

On the morning of the 24th, a very cold mass of air was advancing southeastward over the Gulf States. A low pressure system with warm, moist air appeared over North Carolina and Virginia, but its normal eastward drift was blocked by a stationary high pressure cell in the North Atlantic Ocean. Consequently, the low pressure area advanced northward across Pennsylvania to New York State, and then curved westward. Because of the contrasting air masses, the low pressure system rapidly increased in intensity and magnitude. Its winds increased to gale force and were accompanied by heavy precipitation. In the cold sector of the storm, precipitation was in the form of snow, but in the warm sector, which was over the Upper Basin, heavy rainfall occurred, with 4.01 inches at Coudersport, Pa., and an Upper Basin average of 2.24 inches. The Lower Basin received only 1.40 inches, average, during this storm. The isohyetal pattern for the November 1950 storm is shown on plate E10.

f. Storm of 6-10 March 1956.

March 1956 began with 2 to 5 inches of snow on the ground in the Upper Basin, with smaller amounts in the Lower Basin. High temperatures in the first week melted the snow, saturating the ground, and then heavy thunderstorm activity dropped about 2.8 inches of rainfall over the entire Genesee basin. The equivalent rainfall for the entire period, including melted snow, was 3.20 inches over the entire Genesee Basin.

g. Storm of 21-26 April 1961.

While this storm was only moderate in magnitude, it was investigated because most of the existing rainfall gages were operative for the period, and all precipitation for the storm was in the form of rain, thus allowing a reasonably good analysis of the rainfall pattern. Also, although the overall average for the entire Genesee basin was 2.36 inches, the average for the largest tributary, Canaseraga Creek, was 3.06 inches. The isohyetal pattern for the storm is shown on plate E11.

9. SUMMARY OF STORMS

It will be noted from the above data and descriptions that the preponderance of heavy-rainfall storms are on the Upper Basin. Prior to the construction of Mount Morris Dam, even Upper Basin storms had disastrous effects on the Lower Basin. Since construction of the dam, the Upper Basin storms have virtually been held in check in regard to their effect on the Lower Basin, while Lower Basin storms still cause flooding downstream of Mount Morris.

10. SUMMARY OF CLIMATOLOGY

The Genesee Valley is a region with annual precipitation varying from approximately 25 to 40 inches, and with sharp differences between the western rim and the central part of the valley. Snowfall and depth of snow on the ground is heaviest on the western edge of the valley, with next highest amount usually in the headwaters area. Temperatures have reached as high as slightly over 100 degrees in most parts of the Valley, and have been as low as 20 to 40 degrees below zero. The region is one with a normal summertime deficiency of soil moisture, but with conditions varying from years with no shortages of importance to years with severe drought.

WATER RESOURCES AND HYDROLOGIC EXTREMES

11. SURFACE WATER

a. Collection of data.

The U. S. Geological Survey is the Federal agency primarily responsible for the collection and tabulation of surface and groundwater data. These data are published annually in U.S.G.S. Water Supply Papers. Appendices "H" and "I", which were prepared mainly by the U.S.G.S., give detailed information on surface and groundwater resources and water quality. Plate E12 shows existing stream and lake stage gages in the Genesee River Basin.

12. DISTRIBUTION OF STREAMFLOW

a. Geographic distribution.

Many projects involving water resources require information as to the amount of water available in a given location. Since these amounts vary from location to location, an analysis of the geographic distribution of runoff is necessary. Annual average flow on the Genesee River varies from about 1.10 cfs per square mile at Rochester to about 1.25 cfs per square mile at Scio. The value for Rochester is slightly high, because it reflects flow which is diverted into the *New York State Barge Canal* from outside the Genesee River basin. This flow, diverted from Lake Erie, had a maximum of about 600 cfs from 1926 thru 1948 and a maximum of about 375 cfs since 1948. These flows are equivalent, respectively, to .24 and .15 cfs per square mile at Rochester. Table E3 shows the mean discharge for selected stations in the Genesee River Basin, on a cfs per square mile basis. The stations were selected to give as wide a geographical spread as possible. The two stations in the Canaseraga basin, Dansville and Groveland, have relatively low mean discharges, while Caneadea Creek has a relatively high mean discharge. This reflects the difference in precipitation between the western side of the basin and the central basin, described in paragraph 5b. Five other streams have mean flows significantly lower than the others. These are Conesus, Black, Honeoye, and Oatka Creeks, and Canadice Lake Outlet. The reason for the lower flows on these streams is that they are all relatively flat with large percentages of their drainage areas in lakes, ponds, or marshes. This reduces runoff in two ways. First, since the water lies on the land longer, it has more opportunity to infiltrate into the ground. Secondly, the large areas of open water surface evaporate more water to the atmosphere.

TABLE E3. - Mean discharges for selected stations

Station	Drainage area sq. mi.	Mean discharge cfs/sq. mi.
Genesee River at Scio	309	1.25
Genesee River at Portageville	982	1.22
Genesee River at Jones Bridge	1,419	1.12
Genesee River at Avon	1,666	1.12
Genesee River at Rochester	2,467	1.10*
Canaseraga Cr. near Dansville	153	.99
Canaseraga Cr. at Groveland	181	1.00
Caneadea Cr. at Caneadea	61.5	1.42
Canadice Lake Outlet near Hemlock	12.6	.94
Black Cr. at Churchville	123	.83
Honeoye Cr. at Honeoye Falls	197	.85
Oatka Cr. at Garbutt	208	.95

* Includes diversions from outside the Genesee River basin.

b. Temporal distribution.

The monthly distribution runoff for four selected stations was investigated, to signify the effects of seasonal variation on the magnitude of floods. The stations are Caneadea Creek at Caneadea, Canaseraga Creek at Dansville, Genesee River at Rochester and Genesee River at Portageville. Again, stations were selected to reflect conditions at various geographic locales. The distribution of runoff for each station is shown on figure E-4. The graphs of monthly rainfall curves previously shown on figure E-1, for three westerly and three central stations, are repeated on figure E4 on the curves for Caneadea Creek and Canaseraga Creek, respectively, to illustrate the relation between rainfall and runoff at those stations. The distribution for Rochester again reflects the additional flow diverted into the Barge Canal from outside the Genesee River basin. Table E4 shows the maximum and minimum monthly runoff for each station, in addition to the average monthly runoff.

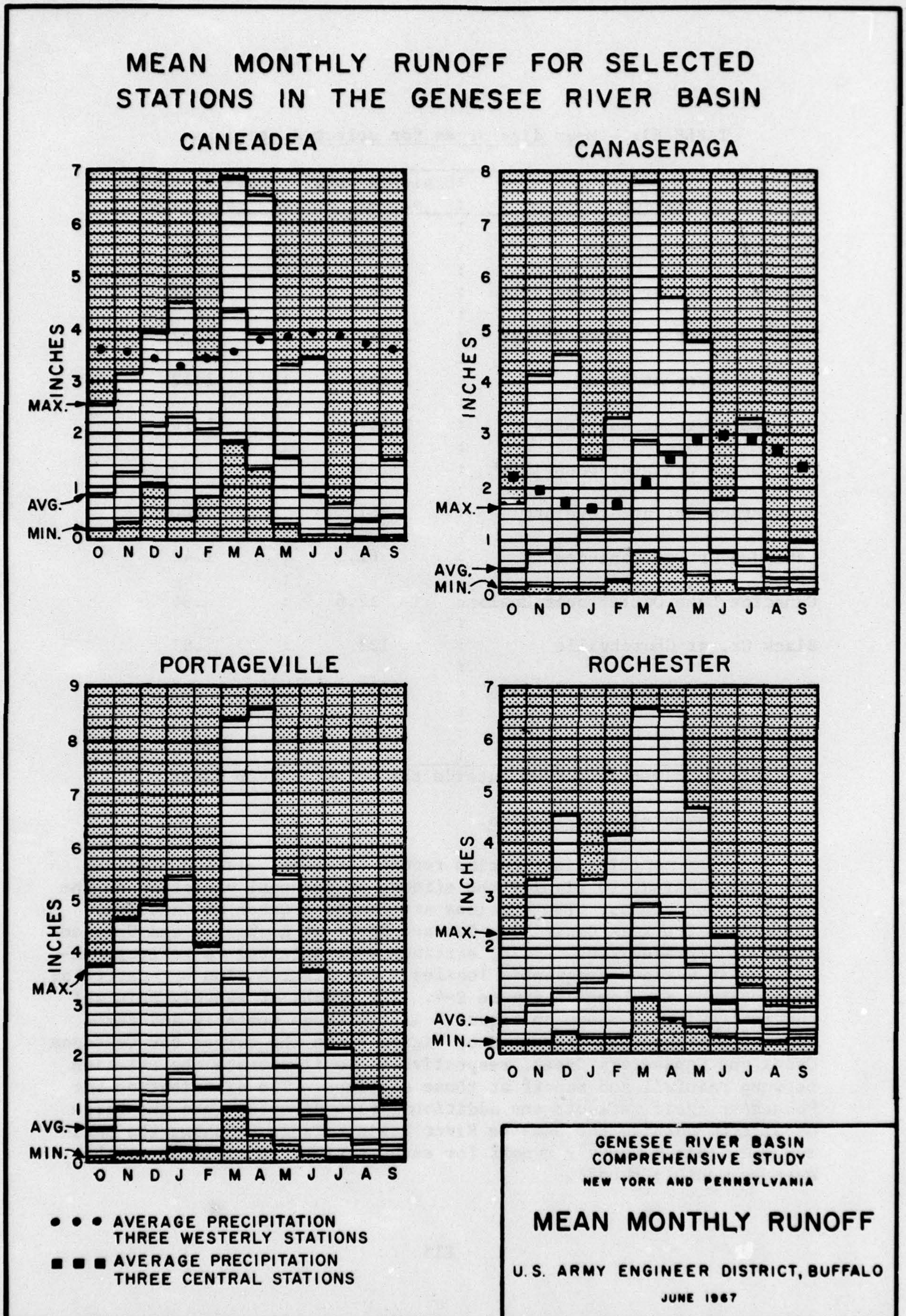

MEAN MONTHLY RUNOFF FOR SELECTED STATIONS IN THE GENESEE RIVER BASIN
CANEADEA
CANASERAGA
PORTAGEVILLE
ROCHESTER
INCHES
MAX.
AVG.
MIN.
O N D J F M A M J J A S
AVERAGE PRECIPITATION THREE WESTERLY STATIONS
AVERAGE PRECIPITATION THREE CENTRAL STATIONS
GENESEE RIVER BASIN COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
MEAN MONTHLY RUNOFF
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E4

TABLE E4. - Monthly runoff in inches

	Oct.	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Total	Mean
Caneadea Creek at Caneadea 1950-1960 11 years														
Avg.	.84	1.26	2.15	2.32	2.08	4.19	3.92	1.55	.84	.30	.34	.44	20.23	1.69
Max.	2.54	3.12	3.95	4.51	3.41	6.85	6.53	3.29	3.42	.67	2.20	1.51		
Min.	.19	.32	1.08	.39	.81	1.86	1.38	.30	.09	.09	.03	.07		
Canaseraga Creek at Dansville 1921-1960 40 years														
Avg.	.43	.74	1.00	1.15	1.15	2.87	2.61	1.53	.79	.49	.30	.30	13.36	1.11
Max.	1.67	4.09	4.50	2.53	3.30	7.78	5.60	4.78	1.79	3.30	.65	.95		
Min.	.14	.16	.15	.14	.25	.80	.62	.35	.21	.12	.13	.11		
Genesee River at Portageville 1909-1960 52 years														
Ave.	.61	1.06	1.33	1.70	1.43	3.51	3.20	1.81	.87	.49	.34	.33	16.68	1.39
Max.	3.76	4.61	4.91	5.44	4.11	8.35	8.54	5.47	3.62	2.13	1.43	1.11		
Min.	.10	.16	.18	.24	.24	1.07	.49	.33	.13	.07	.07	.05		
Genesee River at Rochester 1921-1950 30 years														
Avg.	.61	.94	1.14	1.31	1.41	2.84	2.68	1.65	.96	.62	.50	.47	15.13	1.26
Max.	2.38	3.38	4.57	3.30	4.19	6.55	6.48	4.68	2.23	1.25	.90	.86		
Min.	.26	.26	.42	.37	.38	1.01	.71	.56	.38	.31	.28	.33		

13. VARIABILITY OF STREAM FLOW

The mean annual flow at stations in the Genesee basin varies from year to year. To analyze this variation, a Beard-type[6] statistical analysis was made of the mean annual flows at four stations selected because they were the only ones with more than fifty years of record. The stations are Canaseraga Creek near Dansville, N.Y., Genesee River at Scio, N. Y., Genesee River at Portageville, N. Y., and the Genesee River at Driving Park Avenue in Rochester, New York. The results of the statistical analysis are shown on figure E5. This plate shows the expected frequency of a given mean annual flow for each of the selected stations. The standard deviation of the logarithms of mean annual flows is an indication of the variability of flows in a stream. The standard deviation of the logarithms of the mean annual flows for each of the four stations is about 0.10, indicating that they all have about the same degree of variability. The curves on figures E5 were used to develop figure E6, which shows the variation of the 2, 10, and 50 year mean annual flows with drainage area. Only the main stem stations were used in figure E6, since the flows on the main stem reflect an average of the high westerly and low easterly rainfall amounts.

14. EXTREMES OF ANNUAL RUNOFF

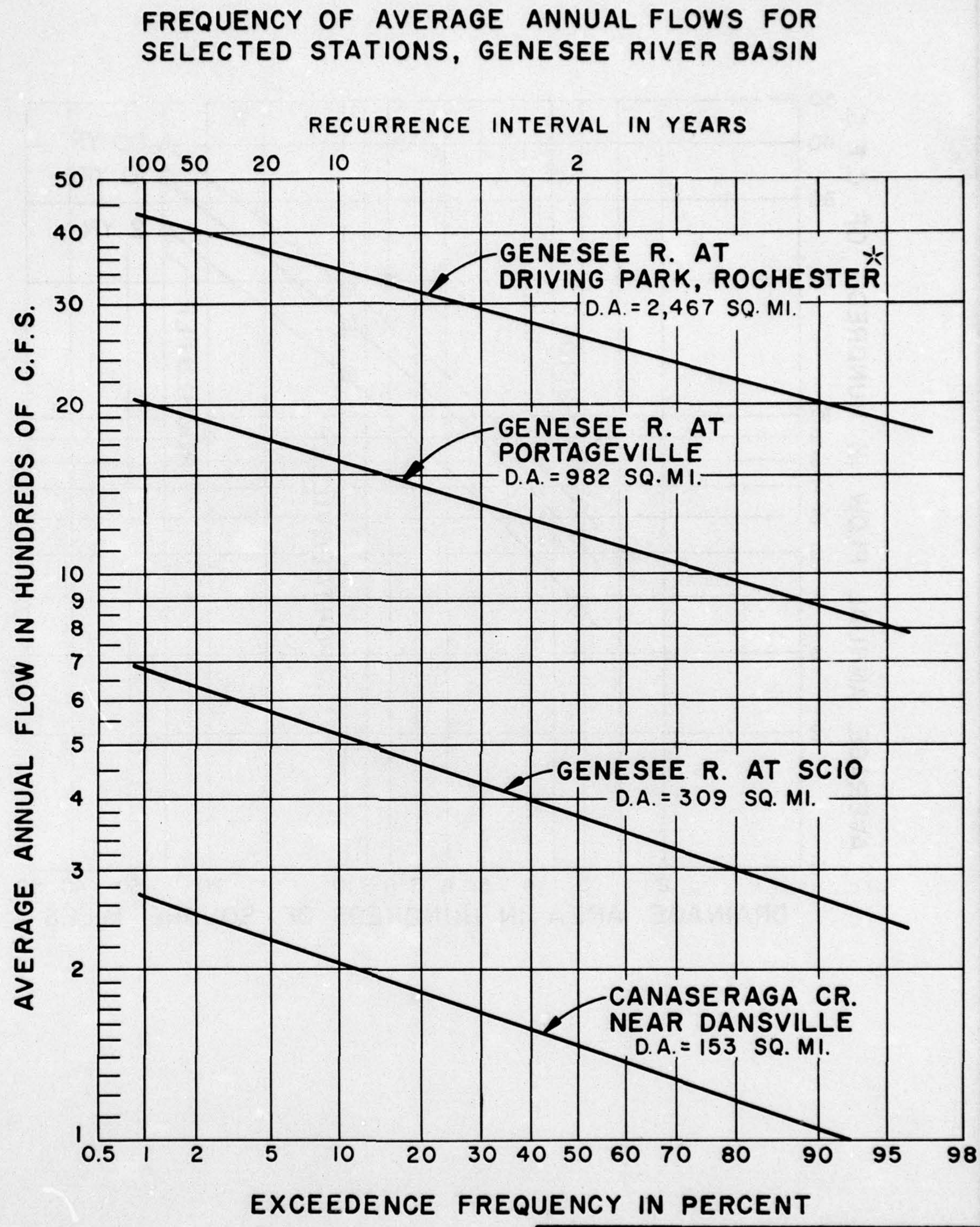
Table E5 shows the extreme high and low average annual runoff for the respective stations.

TABLE E5. - Extremes of annual runoff

Station	Drainage area square miles	Average annual runoff in cfs		
		High	Low	Mean
Canaseraga Cr. near Dansville	153	277	84.8	147
Genesee River at Scio	309	602	277	371
Genesee River at Portageville	982	2,040	766	1,183
Genesee River at Rochester	2,467	4,237	1,718	2,107

15. FLOW DURATIONS

From data furnished by the U. S. Geological Survey, mean daily flow-duration tables are available for 15 stations in the Genesee River basin, for various periods of record. For this study only the records through 1960 were used. The flow duration curves for four



* INCLUDES YEARS IN WHICH MOUNT MORRIS WAS OPERATING (REGULATION DOES NOT SIGNIFICANTLY AFFECT AVERAGE ANNUAL FLOWS)

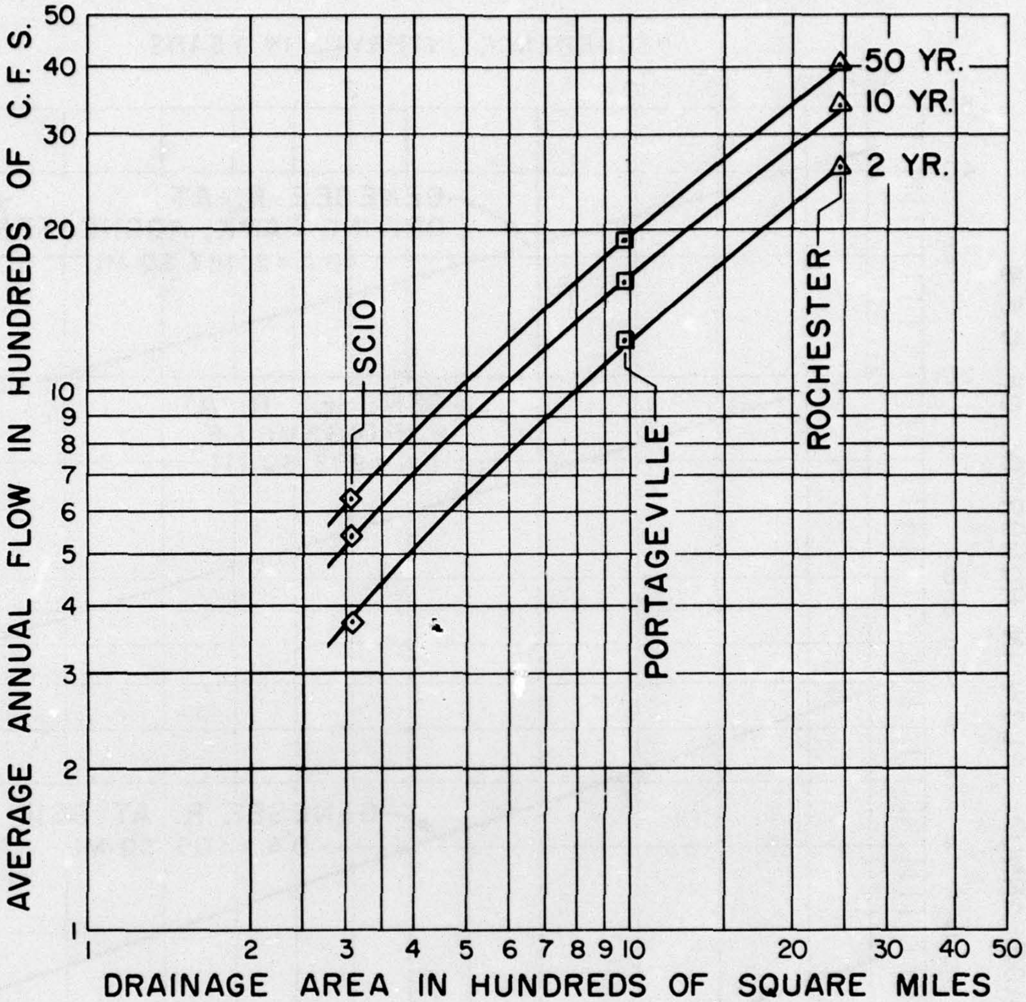
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

AVERAGE ANNUAL FLOW FREQUENCIES

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E5



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

ANNUAL FLOWS VS DRAINAGE AREA

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E6

selected stations are shown on figure E7. The curve for Rochester again reflects diversions into the Genesee Basin, in the significantly higher lower limb of the curve.

16. LARGE FLOODS OF RECORD

Damaging floods on the Genesee Basin have occurred in all months of the year except August. Summer floods are, in general, localized in a part of the watershed and are usually the result of convectively unstable air conditions. Winter and spring floods are usually the result of frontal precipitation on saturated or frozen ground or on melting snow cover although floods have occurred from melting snow cover alone. Descriptions of the largest floods of record follow:

a. Flood of March 1865.

The largest known peak discharge at Rochester, estimated at 54,000 second-feet, was the result of a heavy snowfall, followed by a sudden thaw accompanied by warm rains. The capacity of the channel in Rochester at that time was less than 40,000 second-feet; hence, at the flood crest an overflow in excess of 14,000 second-feet flowed into the city, inundating most of the central portion and causing extensive damage. The flats from Rochester to Mount Morris were flooded, and the embankment of the New York Central Railroad near Avon was destroyed.

b. Flood of March 1875.

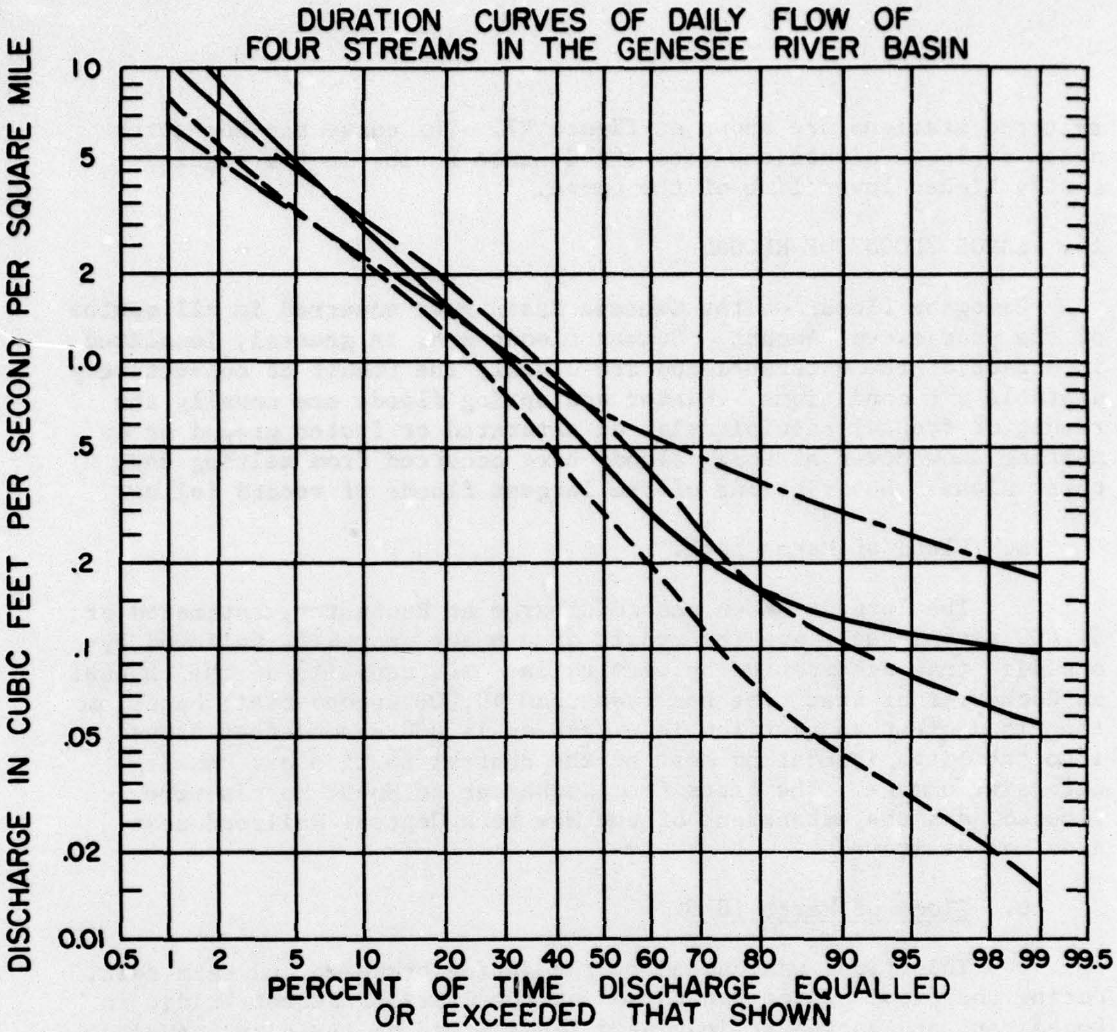
This flood was caused by the spring break-up and warm rain. During the flood an ice jam formed at the Clarissa Street bridge in Rochester, and backwater inundated large areas of the city, causing extensive damage.

c. Flood of June 1889.

As a result of general rains, all streams in western New York were in flood. Bridges were washed out at Wellsville, Belmont, Mount Morris, and Dansville, and agricultural activities in the Genesee and Canaseraga valley flats were severely damaged, although Rochester escaped damage.

d. Flood of May 1894.

Heavy precipitation terminated a long wet spell. The discharge at Mount Morris increased from 5,000 to 42,000 second-feet in less than 36 hours. The Canaseraga and Genesee flats were inundated to depths of 4 to 6 feet, and the area covered was stated by local newspapers to be 60 to 80 square miles. The valley storage reduced the discharge at Rochester to approximately 30,000 second-feet, and little damage occurred in the city.



LEGEND

CANASERAGA CREEK AT DANSVILLE. D. A. 153 SQ. MI.

GENESEE RIVER AT SCIO. D. A. 309 SQ. MI.

GENESEE RIVER AT DRIVING PARK, ROCHESTER. D. A. 2467 SQ. MI.

BLACK CREEK AT CHURCHVILLE. D. A. 123 SQ. MI.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

DURATION CURVES OF DAILY FLOW

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E7

e. Flood of April 1896.

This flood was caused by melting snow from the hills of the watershed flowing into swollen streams. The Genesee and Canaseraga flats were inundated but the flood preceded the growing season and little damage resulted. Rochester was not affected.

f. Flood of March 1902.

This flood was caused by a sudden thaw, during which no appreciable precipitation occurred. The Genesee flats were flooded, and bridges in the upper basin were washed out. Part of the business section of Rochester was inundated to a depth of about 2 feet.

g. Flood of July 1902.

This flood was the result of a heavy rainfall on ground saturated by prior light rains. Local interests estimated the flow at Mount Morris to have exceeded 40,000 second-feet, and the flats in the Canaseraga and Genesee valleys were inundated with large resulting damages to crops. At Rochester, the discharge did not exceed 20,000 second-feet and no damage occurred.

h. Flood of March 1913.

Streams flowing at near-bankfull capacity, as the result of a thaw, were augmented by 5 days of heavy rainfall. During the period 23-27 March, inclusive, the total rainfall for the upper basins was 4.93 inches and for the lower, 3.94 inches. The resulting flood peaked at 37,800 second-feet at St. Helena, 38,000 at Jones Bridge, and 42,000 second-feet at Rochester. The Canaseraga flats were in flood nearly to Dansville, and the Genesee flats, from Mount Morris to Rochester. Parts of the business section of Rochester were inundated and damages were large.

i. Flood of March 1916.

This flood was caused by rapid melting of a heavy snow cover. The peak discharge of 48,300 second-feet at Rochester was the greatest since 1865, but, because of channel improvements through the city, completed after the 1913 flood, little damage occurred.

j. Flood of May 1916.

This flood, the second of the year, was caused by excessive precipitation. Discharges of 44,400 and 55,100 second-feet were recorded at St. Helena and Jones Bridge, respectively, and are the greatest of record for these stations. Early crops in the flats were affected but the loss was small, and the city of Rochester sustained no damages.

k. Flood of December 1927.

As the result of a long wet spell terminated by 2 days of heavy rainfall, crests of 46,800 second-feet at Jones Bridge and 29,600 second-feet at Rochester occurred on 1-2 December, respectively. The Genesee and Canaseraga flats were inundated but little damage occurred. Rochester was not affected.

l. Flood of July 1935.

This flood, caused by an intensive 3-day rainstorm, concentrated over south central New York, and affected only the southeastern portion of the Genesee basin. Precipitation stations in this portion of the basin, Alfred, Andover, Angelica, and Dansville, recorded totals for the 3-day rain ranging from 5.37 to 6.35 inches. No excessive rains were recorded by stations in other sections of the Genesee basin. The peak dishcarges in the Genesee River were only 14,500 second-feet at Jones Bridge and 18,600 second-feet at Rochester, whereas the station near Dansville on Canaseraga Creek recorded a peak flow of 8,390 second-feet, the maximum of record. The principal damage areas were the agricultural lands in the Canaseraga valley, and the village of Wellsville on Dyke Creek. Damage in the Genesee flats was small and Rochester was not affected.

m. Flood of July 1942.

Floods, confined principally to western Pennsylvania, were caused by very intense rainfall over a relatively short duration. Records for point rainfall for durations up to 24 hours were broken during this storm. On the Genesee Basin, damage was confined to the upper reaches in the vicinity of Wellsville. The rainfall at Alfred, Andover, and Angelica, for 17-18 July was 3.35, 4.10, and 4.05 inches, respectively. The records from automatic rainfall recorders indicate that most of the precipitation occurred during the evening of the 17th and the early morning of the 18th. Peak discharges of 11,200, 18,900 and 15,700, were recorded at Scio, St. Helena, and Jones Bridge, respectively.

n. Floods of March-April 1950.

This period covers two rises a week apart. The first was caused by snowmelt accompanied by light precipitation and produced a crest of 45,400 cfs at Jones Bridge on the 29th of March. The second crest, on 5 April, was the result of moderate rainfall on wet soil and produced a crest at Jones Bridge of 25,200 cfs.

o. Flood of November 1950.

The heavy rain of November 25 caused high water in the Upper Basin, where Wellsville experienced the worst flood in the history of the village. The south side of the village was inundated and many families were taken from their homes in boats. Several sections of highway near Wellsville and Portageville were under water. In the Lower Basin, flooding was slight, although some flatlands were flooded and sections of highway near Geneseo were covered by water.

p. Flood of March 1956.

This flood was of the type common in the Genesee River basin, a combination of warm rain and snowmelt. This flood occurred after completion of Mount Morris Dam, and gives an example of the operation procedures used during a flood. Releases were reduced to about 300 cfs when the storm began, and then were increased to develop a flow of 12,000 cfs at the Jones Bridge gage, after the danger of downstream flooding had passed. Lowlying farmlands below Avon were flooded from local runoff, and there was some backwater flooding during the reservoir evacuation period. Part of this flooding was due to the fact that because of the protection provided by the dam, there has been some encroachment into the old flood plain, and also some banks have been breached by local farmers in order to drain their lands. This backwater flooding prompted reconnaissance of the Lower Basin, which established 10,500 cfs as a within - channel capacity in the vicinity of Avon and set the Avon gage as the primary control point for future evacuation periods. The storm runoff resulted in a peak inflow to the reservoir of 46,000 cfs and the operation of the dam controlled the flow at Jones Bridge to not more than 12,000 cfs. The flood discharge at Rochester was held to 24,300 cfs, in contrast to an estimated natural flow of 48,300 cfs. The maximum storage in the reservoir was 183,540 acre feet, with a corresponding pool elevation of 706.9 feet.

q. Flood of March-April 1960.

This flood produced the greatest flood volume since the completion of Mount Morris Dam, and was caused primarily by melting of a heavy snow cover. Prior to the flood, the average water content of the snow cover was 3.3 inches in the Upper Basin and 4.1 inches in the Lower Basin. Therefore, with a sudden rise in temperature, the Lower Basin had the potential of a serious flood, even with no discharge from the reservoir. Releases from the reservoir were reduced to 300 cfs when a general thaw was forecast, and after the danger of downstream flooding was passed, flows were increased to 10,500 cfs at Avon.

Lowlying farmlands again were flooded by local runoff, but no backwater flooding occurred during the evacuation period. The peak inflow to the reservoir was 35,000 cfs and the controlled peaks at Jones Bridge and Avon, repectively, were 10,000 cfs and 10,500 cfs. The peak discharge at Rochester was reduced to 25,800 cfs from an estimated natural flow of 45,000 cfs. The maximum storage in the reservoir was 215,845 acre-feet with a corresponding pool elevation of 719.35 feet.

r. Flood of April 1961.

This flood was of moderate proportions throughout the Genesee basin, with no significant flooding except in the Canaseraga Creek watershed. It was the fourth highest flood of 50 years of record at Dansville, with a peak of 8.230 cfs, and the highest of 12 years of broken record at Shakers Crossing, near the mouth of the Canaseraga. Flooding of the rich farmland in the Canaseraga valley caused extensive damage.

17. MAXIMUM FLOODS OF RECORD

Table E6 shows recorded maximums for all stations in the Genesee basin for which such data are available[9] The streams are listed in table E6 in order from the upstream to the downstream portion of the basin. It will be noted from table E6 that the maximum discharges at Jones Bridge and Rochester are nearly the same, even though the drainage area at Rochester is almost double that at Jones Bridge. This has occurred in the majority of floods, both before and after completion of Mount Morris Dam, and is due to some natural storage between Jones Bridge and Rochester, and the general movement of storms in the Genesee region. As can be seen from plates E8 - E11, storms generally move across the Genesee basin rather than along the general direction of flow of the river. Because of this type of storm movement, the full effect of most storms are not felt over the entire basin.

18. FLOOD HYDROGRAPHS

Plate E13 shows flood hydrographs for various floods at selected stations in the Genesee basin.

TABLE E6 · Maximum floods of record

Stream and place of determination	County	Drainage Area (sq mi)	Period of Record	Known Maximum				
				Date	Gage Height (feet)	Elevation (msl)	Discharge cfs	csm
Dyke Creek at Wellsville	Allegany	71.4	1955-60	June 15, 1960	16.10	1,508.28	5,230	73.2
Genesee River at Wellsville	Allegany	288	1955-58	Mar. 8, 1956	17.65	1,490.65	15,800	54.8
Genesee River at Scio	Allegany	309	1916-67	Nov. 25, 1950	11.22	1,450.05	23,300	75.4
S. Br. Van Campen Creek at Nile	Allegany	5.19		Aug. 1, 1950			3,280	632
Angelica Creek at Angelica	Allegany	61.0		July 18, 1942			14,000	230
Caneadea Creek at Caneadea	Allegany	61.5	1950-67	Sept. 28, 1967	13.09	1,251.16	13,800	222.6
Lost Nation Brook near Centerville	Allegany	1.12	1934-35	Jan. 9, 1935			49	44.5
Genesee River at Portageville	Wyoming	982	1909-67	May 17, 1916 Mar. 7, 1956	 21.70	 1,104.30	44,000	45.2
Genesee River at St. Helena	Wyoming	1,017	1908-50	May 17, 1916	12.81		44,400	43.7
Genesee River at Mount Morris	Livingston	1,078	1894-09	May 21, 1894			42,000	39.0
Stony Brook at Stony Brook Glen	Steuben	18.1		July 1935			5,800	320
Canaseraga Creek near Dansville	Livingston	153	1910-12, 1915-17, 1919-67	July 23, 1940	13.1	653.10	8,830	57.7
Canaseraga Creek at Cumminsville	Livingston	155	1917-19	July 23, 1940			9,110	58.8
Canaseraga Creek at Groveland	Livingston	181	1915-16, 1917-20, 1955-63	May 22, 1919 Mar. 7, 1956	 13.71	 579.13	4,380	24.2
Keshequa Creek at Craig Colony, Sonyea	Livingston	69.1	1910-12, 1917-32	Mar. 14, 1918			5,940	86.0
Keshequa Creek near Sonyea	Livingston	76.5	1915-17	Mar. 27-28, 1916			1,660	21.7
Canaseraga Creek at Shakers Crossing	Livingston	333	1915-22, 1959-67	May 17, 1916 Apr. 26, 1961	23.62 12.07	568.92 557.37	 4,430	 13.3
Genesee River at Jones Bridge, near Mount Morris	Livingston	1,419	1903-1906 1908-1914, 1915-67	May 17, 1916	25.44	565.44	55,100	38.8
Beards Creek at Leicester	Livingston	12.4		Mar. 1, 1955			2,260	182
Conesus Creek near Lakeville	Livingston	72	1919-34	Dec. 1-2, 1927			625	8.7
Limekiln Creek near Springwater	Livingston	4.55		Aug. 9, 1953			2,130	468
Jess Brook at Springwater	Livingston	0.37		Aug. 9, 1953			165	446
Genesee River at Avon	Livingston	1,666	1955-67	Mar. 7, 1956	37.20	537.20	15,600	9.36
Honeoye Creek at Honeoye Falls	Monroe	197	1945-67	Mar. 28, 1950	6.42	616.40	4,630	23.5
Honeoye Creek at East Rush	Monroe	238	1903-06	Apr. 4, 1903			2,710	11.4
Oatka Creek near Warsaw	Wyoming	22.0		Mar. 1, 1955			1,760	80.0
Stony Creek near Warsaw	Wyoming	8.03		Mar. 1, 1955			1,080	134
Oatka Creek at Garbutt	Genesee	208	1945-67	Mar. 31, 1960	8.64	569.53	6,920	33.9
Black Creek at Churchville	Monroe	123	1945-67	Mar. 31, 1960	9.44	561.89	4,880	39.7
Genesee River at Elmwood Ave., Rochester	Monroe	2,450	1905-18	Mar. 30, 1916	12.3	519.15	48,300	19.7
Genesee River at Driving Park Avenue, Rochester	Monroe	2,467	1904-67	Apr. 2, 1940 Mar. 18, 1865	17.08		 54,000	 21.9

19. FLOOD HYDROLOGY

Certain basic information and analysis are required in order to properly evaluate the rainfall and runoff relations and other parameters which influence the flood regimen in a river basin. These include flood peak frequencies, flood volumes, unit hydrographs and flood routing procedures.

20. FLOOD PEAK FREQUENCIES

a. General.

Geological Survey records are available for 8 stations in the Genesee River basin with periods of record long enough to anaylze statistically. Also analyzed, for use in generalized studies, was one stream in a watershed adjacent to the Genesee basin. Discharge frequency curves for sites in the Upper and Lower Basins, respectively, are shown on plates E14 and E15.

b. Annual peak discharge frequencies at individual stations.

The annual peak discharges at each station were analyzed in accordance with Beard's[6] methods, and the mean logarithm of flows and the standard deviation of the logarithms were determined for each station. The mean logarithm is an indication of the relative magnitude of flood peaks, and the standard deviation is an indication of their variability. The mean logarithm varies generally with some power of drainage area, while the standard deviation is a more complex function, depending on hydrologic and geographic characteristics of the basin involved. The low values of the standard deviation for Jones Bridge and Rochester under reservoir conditions indicate the degree to which the variability of flood peaks at those stations has been reduced by Mount Morris Reservoir. The standard deviation at Jones Bridge is lower than that at Rochester, indicating that the effects of the dam are greater at the upstream station. The stations and their statistics are listed on table E7.

TABLE E7. - Summary of peak frequency statistics

Stream	Station	Drainage: area sq. mi.	Yrs. of record	m	s
Genesee River	Scio	309	47	3.877	.222
	Portageville	982	55	4.346	.157
	Jones Bridge+	1419	58	4.365	.168
	Jones Bridge*	1419	13	4.035	.055
	Rochester ++	2467	41	4.360	.122
	Rochester *	2467	13	4.252	.088
Canaseraga Creek	Dansville	153	50	3.601	.233
Oatka Creek	Garbutt	208	18	3.440	.241
Black Creek	Churchville	123	18	3.223	.240
Honeoye Creek	Honeoye Falls	197	18	3.294	.204
Little Tonawanda Creek	Linden	22	50	3.025	.217

\+ Includes estimates of natural peaks after 1951 (Regulated by Mount Morris Dam).

++ Does not include natural peaks after 1951.

* Actual modified peaks after 1951 were analyzed.

m = Mean logarithm of annual peak discharges.

s = Standard deviation of the logarithms of annual peak discharges.

As shown in table E7, two sets of data were developed for the Genesee River at Rochester, and the Gensess at Jones Bridge. Both of these long-term stations are downstream of Mount Morris Dam. Therefore, curves for these stations were developed both for natural conditions and for reservoir conditions. These curves are also shown on plate E15.

21. GENERALIZED FREQUENCIES

Generalized frequency curves were developed in order to determine flood peak discharge frequencies at ungaged sites, for use in determination of average annual flood damages at those sites. They were developed separately for the Upper and Lower Basins for two reasons. First, because of the previously mentioned topographic differences between the Upper and Lower Basins, and second, because the Lower Basin is presently controlled by Mount Morris Reservoir. The generalized curves for the Upper Basin are shown on figure E8, and those for the Lower Basin are shown on figure E9.

a. Synthetic frequency curves for ungaged sites.

To determine the frequency curve for an ungaged site in either the Upper or Lower Basin, the approporiate plate for generalized frequencies is entered with the drainage area of the watershed above the site in question. Then the discharges for the various lines are read off, and a plot of discharge versus frequency is made for the site.

b. Frequency curves for Genesee River at Wellsville.

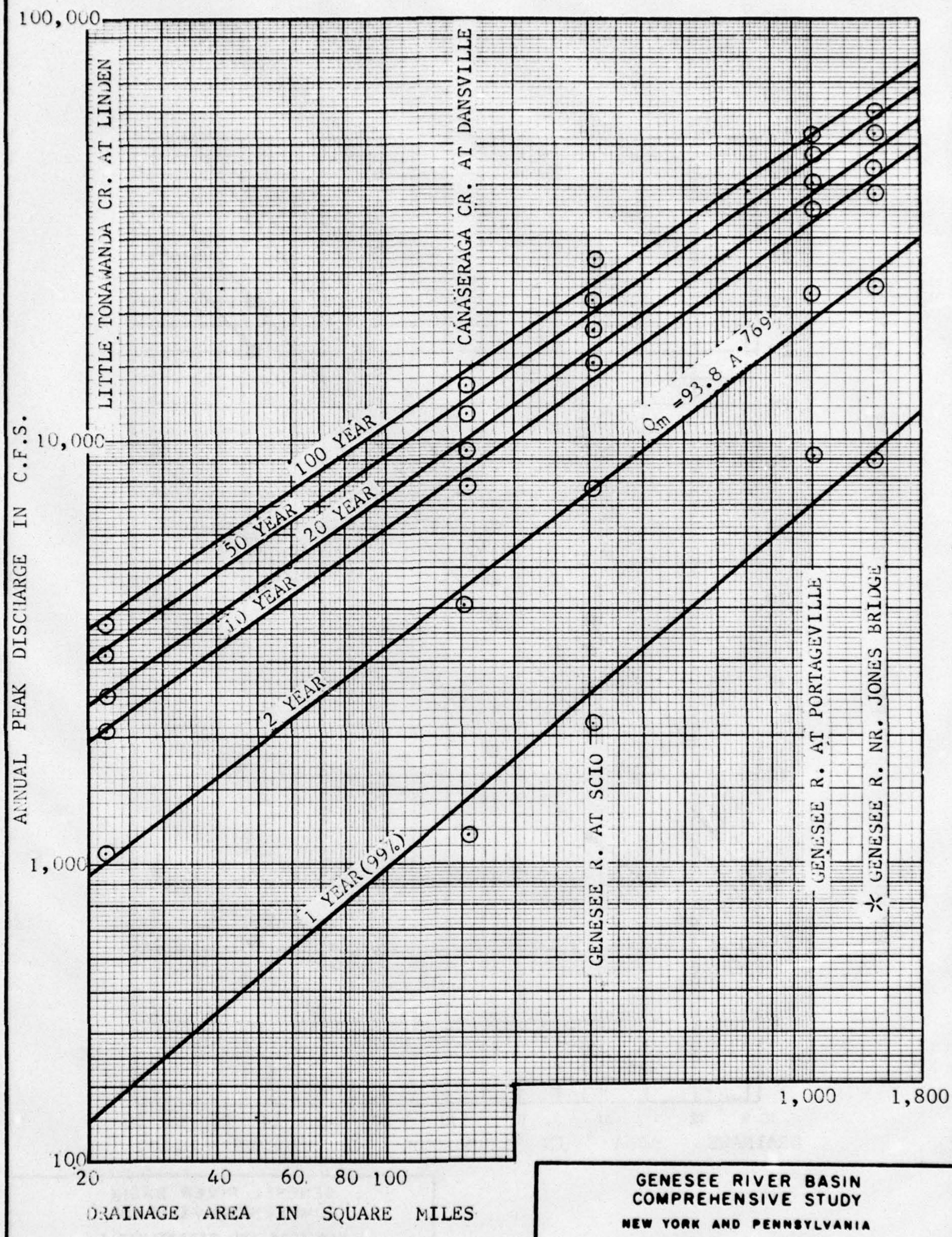
Since the Genesee River at Wellsville was studied in a prior report, the frequency curves at Wellsville had already been determined, using data from the gage site on the Genesee River at Scio. The curves for Scio, as determined by the generalized method and the actual record, along with a partial duration curve, are shown on plate E16, as are three sets of frequency curves for the Wellsville reaches.

c. Frequency curves for the Canaseraga Creek Basin.

Since a study for local improvement on Canaseraga Creek is being made in conjunction with this Comprehensive Study, the frequency curves for Canaserage Creek are presented separately on plate E17.

22. DISCHARGE FREQUENCIES FOR TRIBUTARIES

Discharge-frequency curves for major tributaries of the Genesee River are shown on plate E18. The Soil Conservation Service has developed discharge frequencies at sites on small tributaries of the Genesee River, by use of unit hydrographs for various frequencies in accordance with SCS[7] criteria. The large number of small tributaries analyzed (over 200 damsites were originally investigated) precludes inclusion of data in this appendix, but the data is on file in the Hydrology Section of the U. S. Soil Conservation Service at Syracuse, New York.



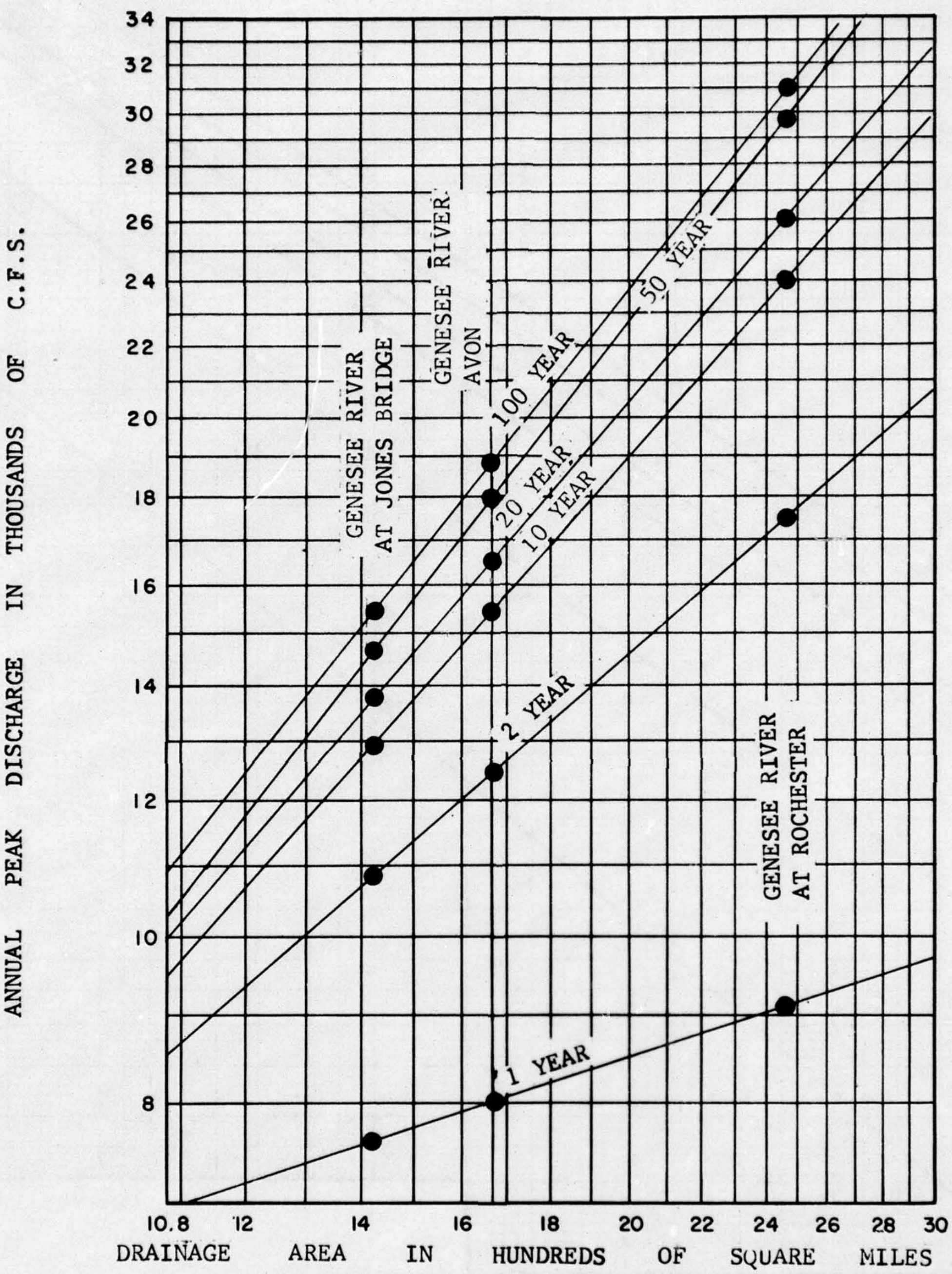
* BASED ON NATURAL FLOWS

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

UPPER BASIN
GENERALIZED FREQUENCIES

U. S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E8



ALL DISCHARGES ARE FOR EXISTING CONDITIONS WITH MOUNT MORRIS RESERVOIR IN OPERATION

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

LOWER BASIN GENERALIZED FREQUENCIES

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E9

23. STAGE-DISCHARGE RELATIONSHIPS

The U. S. Geological Survey prepares rating tables and rating curves for its stream gages form discharge measurements taken while a stream is at a known elevation. All of the nineteen existing recording stream gages in the Genesee River basin are fairly well rated up to moderate discharges. For determining rating curves for ungaged locations, a variety of methods were used, depending on the particular location involved and the amount and type of data available at each location.

24. RATING CURVES

Rating curves, some from actual gage records and some developed by the Corps of Engineers using computation methods, are shown on plates E14 thru E23, for locations on the Genesee River and its tributaries. Again, the rating curves for small tributaries, as developed by the Soil Conservation Service, are not included herein, due to space limitations, but are on file at the Syracuse office.

25. UNIT HYDROGRAPHS

A unit graph (or unit hydrograph) is an indication of the response of a stream to rainfall excess. It represents the discharge hydrograph which would occur if one inch of excess rainfall occurred uniformly over a basin for a specified period of time. Unit hydrographs were derived fromgaged sites when sufficient data was available to permit analysis of concurrent stream gage and precipitation data. Then unit graph characteristics for gaged stations were related to basin parameters at those stations to determine unit graph basin relationships which could then be used to develop synthetic unit hydrographs at ungaged locations. These unit graphs are used to develop design hydrographs for flood control channel improvements, for design of reservoir spillways and outlet works for all purposes, and to reporduce hydrographs for use in routing for flood control, power, or water supply purposes. The unit graphs derived for Genesee River Basin stations are summarized in table E8. Synthetic unit graphs for numerous ungaged locations in the Genesee River Basin are on file in the Hydraulics Branch of the Buffalo District, Corps of Engineers, and the Hydrology Section of the Soil Conservation Service in Syracuse, New York.

TABLE E8. - Derived Unit hydrographs

Stream	Station	Drainage area, sq. mi.	Storm (s) studied	Average excess inches, for storms studied	Period of unit rainfall excess	Time in hours from start of excess to unit graph peak	Unit graph peak ordinate in cfs
Oatka Creek	*Garbutt	208			6	30	4,100
Black Creek	*Churchville	123			6	24	3,300
Honeoye Cr.	*Honeoye Falls	197			6	42	1,800
Canaseraga Cr.	Dansville	153	Apr.' 61	1.2	2	8	9,220
Genesee River	Portageville	982	Nov.' 50 Apr.' 61	1.6	3	21	18,900
Genesee River	Scio	309	Nov.' 50 Apr.' 61	2.1	3	15	9,800
Angelica Creek	Angleica	84.1	Jun.' 64	0.2	1	5	6,900

* Previously developed for use in regulation of Mount Morris Dam.

26. FLOOD VOLUME STUDIES

a. General.

In the design or reservoirs, it is desirable to estimate the frequency with which a given flood volume will recur, in order to determine the frequency with which the reservoir will be filled.

b. High-flow-durations at selected gaged sites.

Using data provided by the U. S. Geological Survey, frequency analyses were made on consecutive high flows for fifteen stations in the Genesee River Basin. The results of the frequency studies were plotted on logarithmic probability paper, and a typical set of curves is shown on figure E10.

c. Flood volumes at ungaged sites.

Since most reservoirs are constructed at previously ungaged locations, it is necessary to develop some generalized procedure for determining volumes at ungaged sites. To accomplish this, the curves co-responding to figure E10 for each of the fifteen stations studied, were used to determine curves of high flow versus drainage area, for a given duration and for the 2-year and 20-year recurrence intervals. A typical example is figure E11. These curves were developed for high-flow durations from 1 to 183 days. To determine high flow duration curves for an ungaged site, the high flow-versus-drainage area curves are entered with the drainage area above the ungaged site, and the 2-year and 20-year flows are read off for each duration desired. These are then plotted on log-probability paper, and result in curves such as figure E10, except that they are for ungaged sites. These curves were then used to determine the runoff for a given frequency and duration. Since a given runoff for a given duration equals a finite volume, maximum volume curves for a number of frequencies can be developed. Figure E12 is an example of one such curve. Data for determining runoff duration curves for any ungaged site are available in the Hydraulics Branch of the Corps of Engineers Buffalo District office, or in the Hydrology Section of the Soil Conservation Service in Syracuse, New York.

27. DROUGHTS

a. General.

The drought potential of the Genesee River Basin was studied by analyzing the low flow records of fifteen stations within the basin, much in the same manner as the high flows were studied, described in paragraph 26b and 26c alone. A detailed study on low flows is presented by the U. S. Geological Survey in Appendix H.

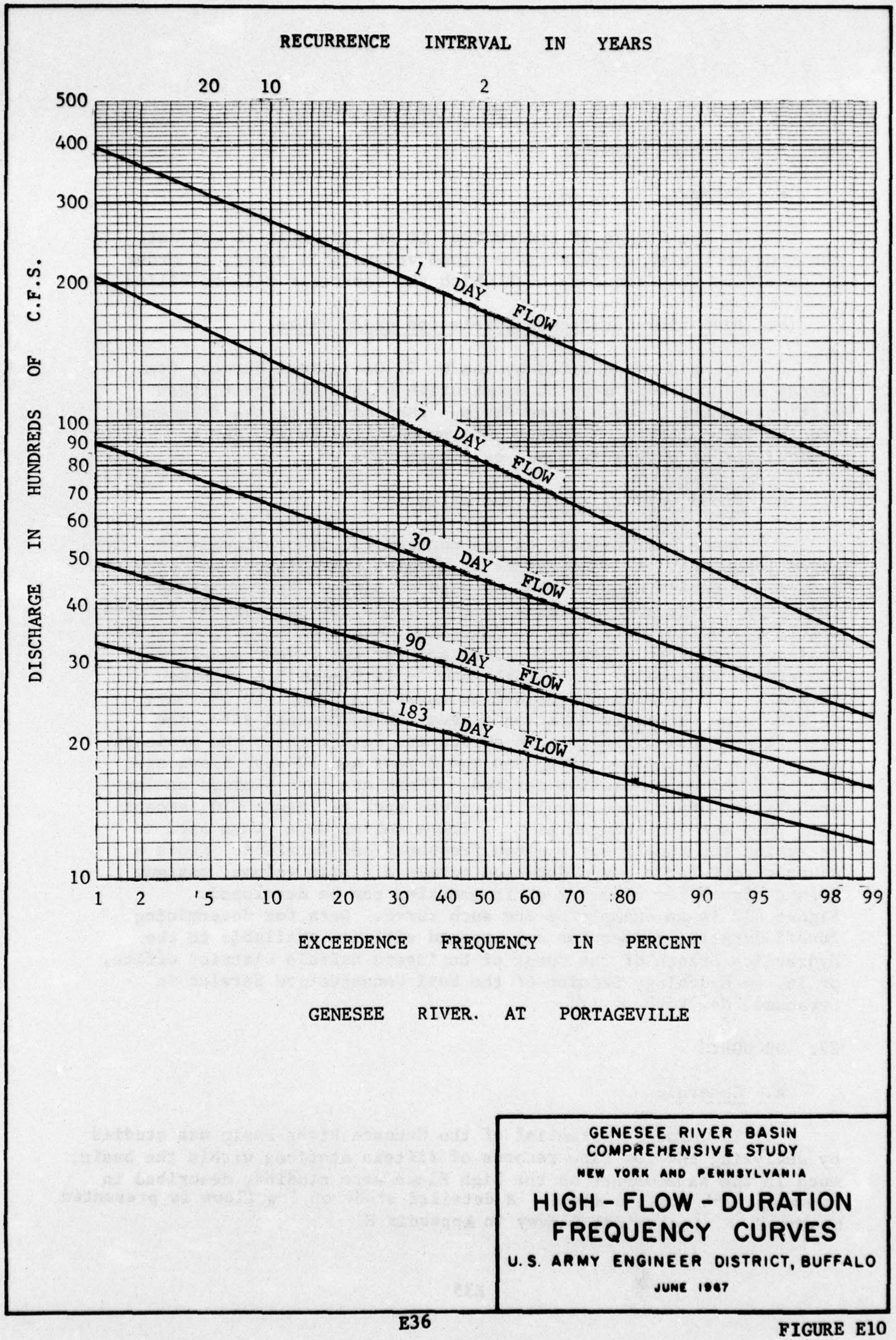
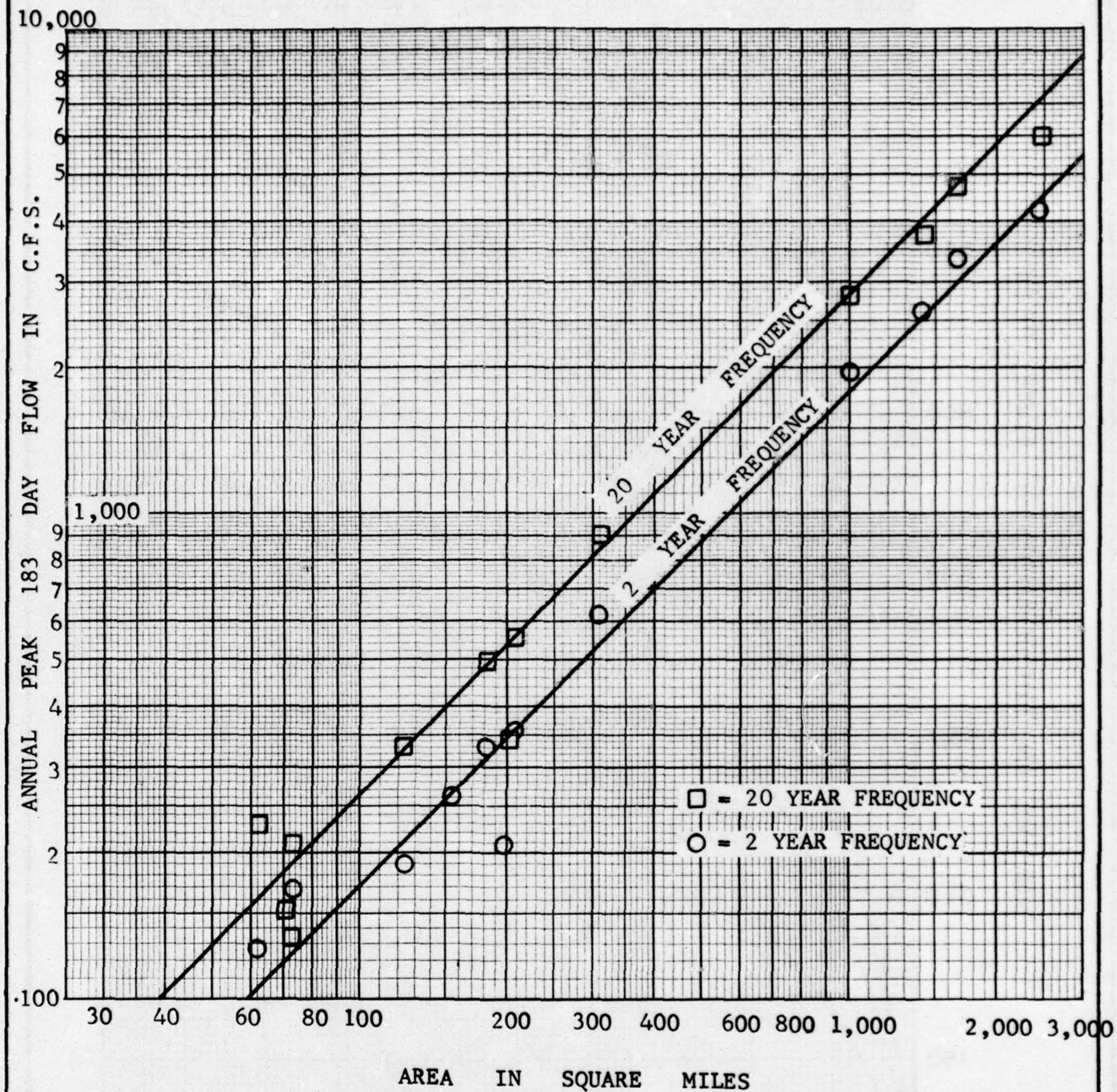

RECURRENCE INTERVAL IN YEARS
20
10
2
500
400
300
200
100
90
80
70
60
50
40
30
20
10
DISCHARGE IN HUNDREDS OF C.F.S.
1 DAY FLOW
7 DAY FLOW
30 DAY FLOW
90 DAY FLOW
183 DAY FLOW
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
EXCEEDENCE FREQUENCY IN PERCENT
GENESEE RIVER. AT PORTAGEVILLE
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
HIGH-FLOW-DURATION
FREQUENCY CURVES
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E10



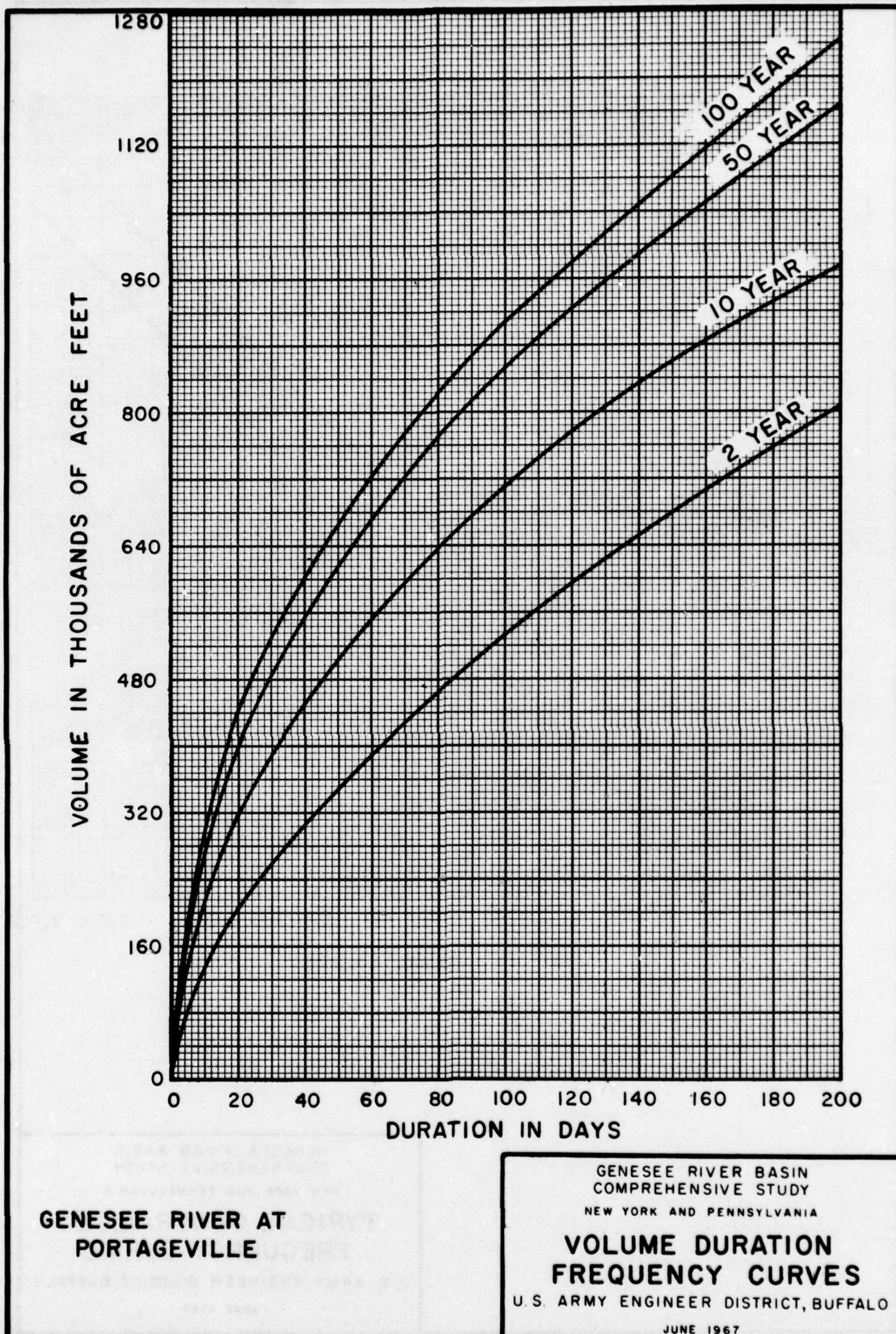
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

TYPICAL GENERALIZED FREQUENCY CURVE

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E11



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

VOLUME DURATION FREQUENCY CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E12

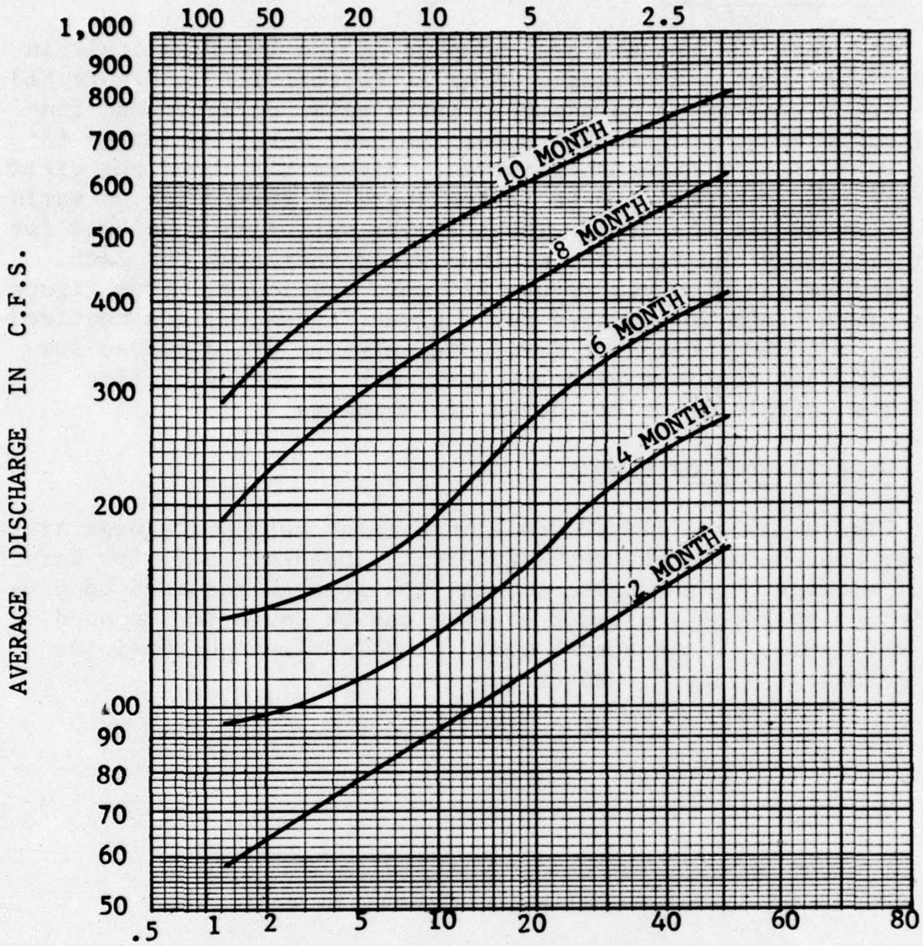
b. Individual sites.

Figures E13 thru E18 are examples of the low flow analysis at an individual site, the Genesee River at Portageville. Figure E13 shows the low discharge to be expected for a given duration and frequency of occurrence. Figure E14 shows the same data, replotted for ease in preparation of succeeding curves. Figure E15 shows the yield in cfs which can be expected once in ten years if reservoirs of various sizes are provided at the site. These curves were also developed for a 20-year frequency and from the minimum yield indicated for each storage, minimum yield curves figure E16 were developed. From figure E16, if a given yield is required for a given frequency, the required storage can be found. Data for developing minimum yield curves for any of the fifteen stations used are available in the Hydraulics Branch of the Buffalo District, Corps of Engineers.

c. Generalized low flows.

Figure E17 and E18 show minimum yields versus drainage area for 10-year and 20-year recurrence intervals, respectively, for varying amounts of storage. Using these curves, the storage required to provide a minimum yield of a given frequency can be found for ungaged sites in the basin. These curves would be valuable in determining possible reservoir sites for water supply.

RECURRENCE INTERVAL IN YEARS



EXCEEDENCE FREQUENCY IN PERCENT

GENESEE RIVER AT PORTAGEVILLE

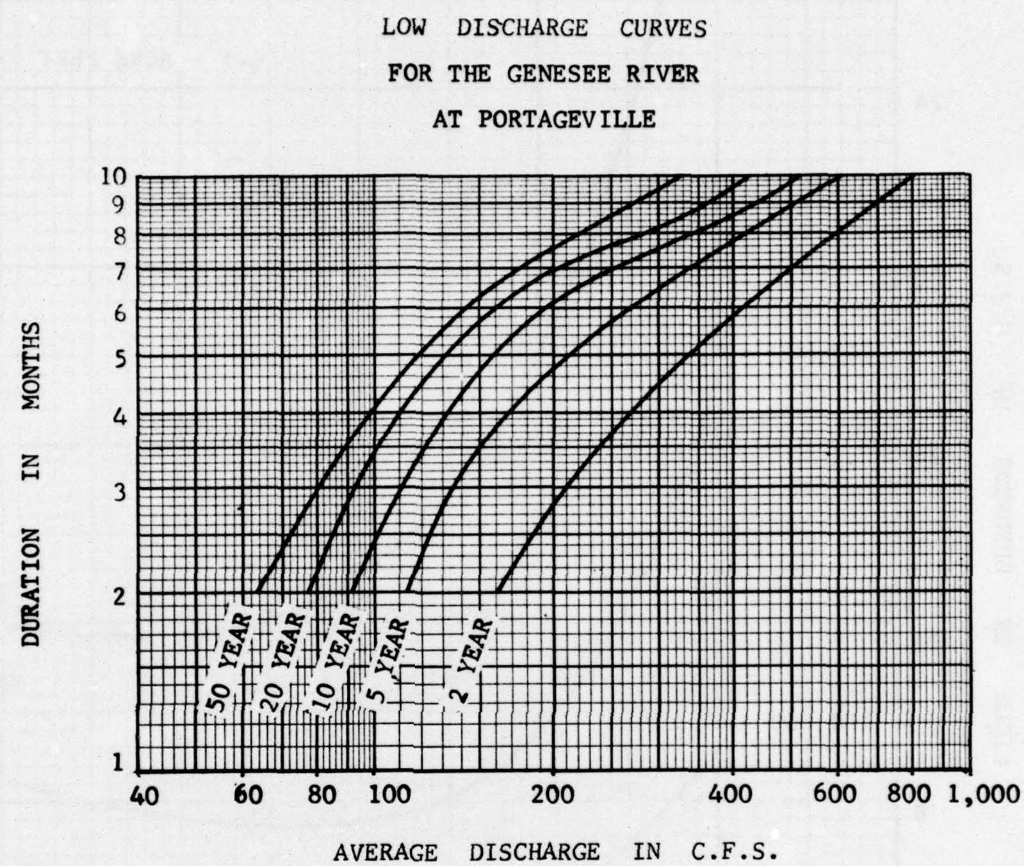
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

LOW DISCHARGE
FREQUENCY CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E13

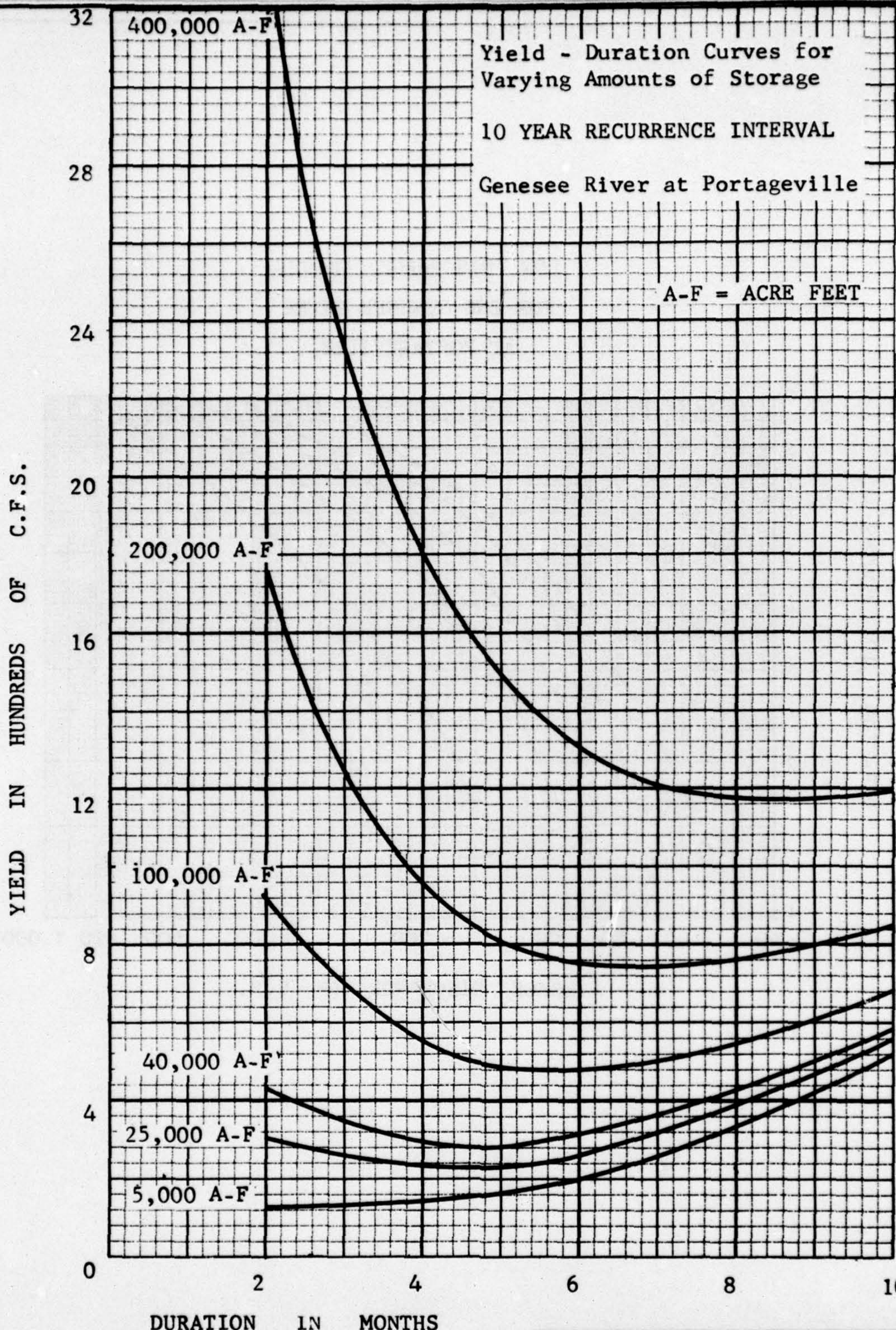


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

LOW DISCHARGE CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E14



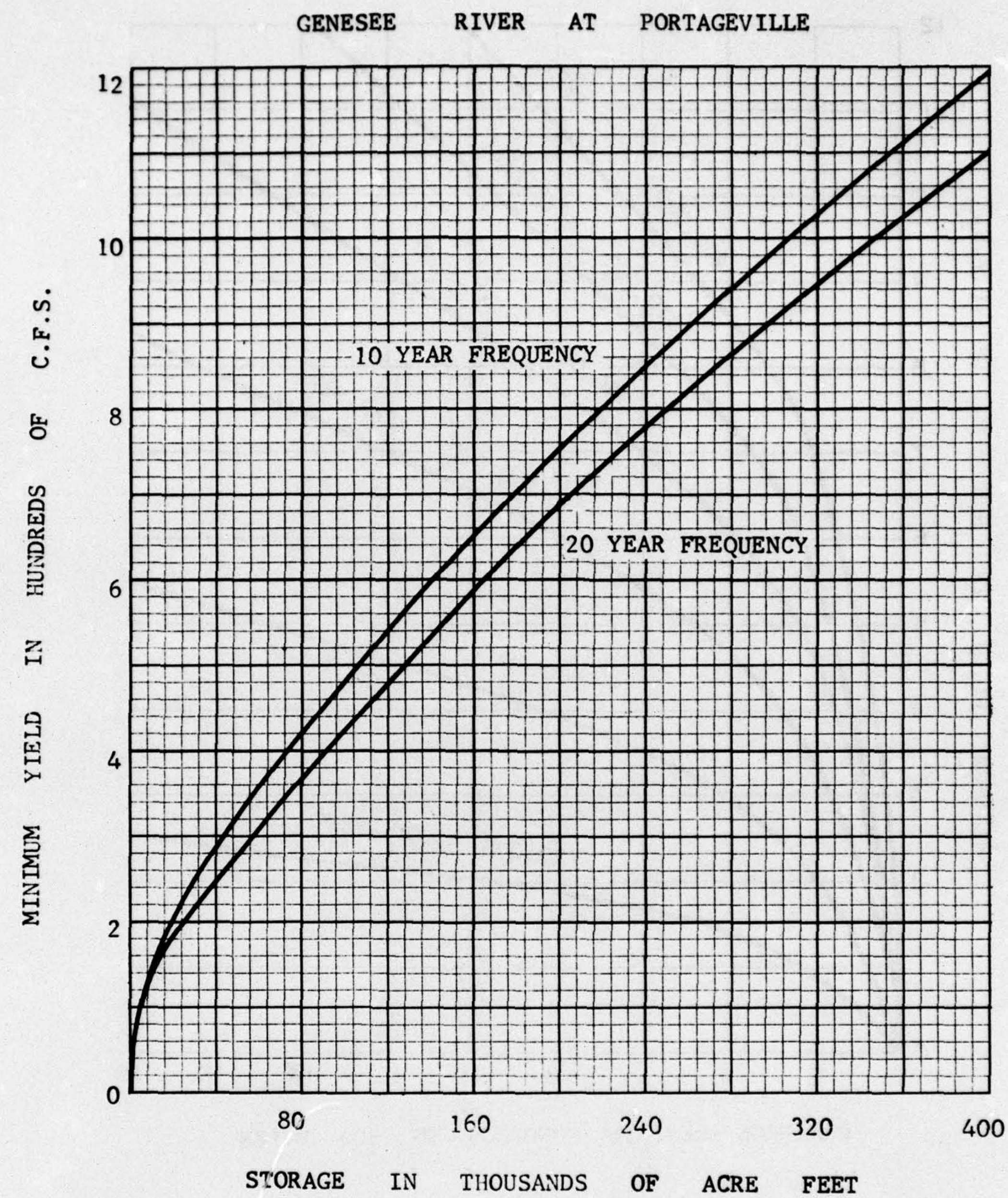
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

YIELD - DURATION CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E15

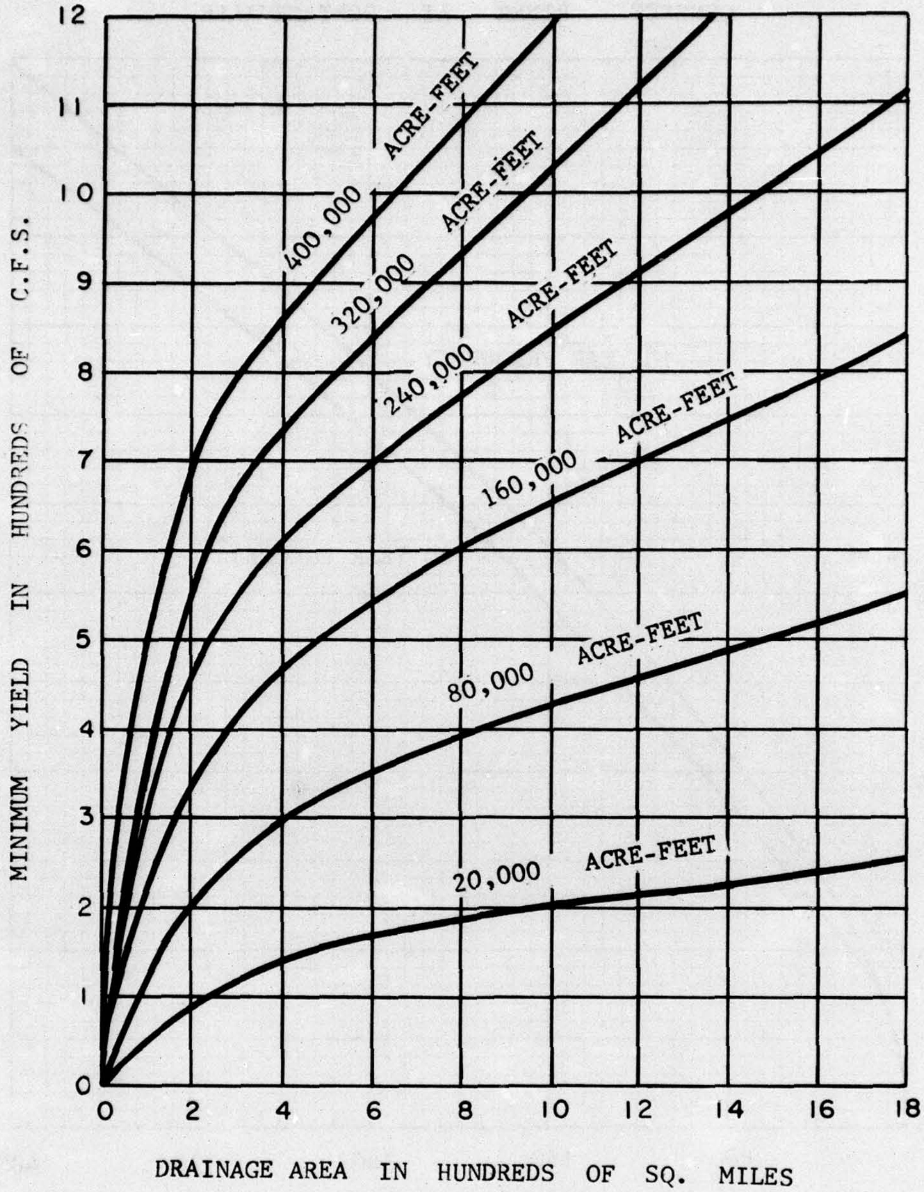


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

MINIMUM YIELD CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E16



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

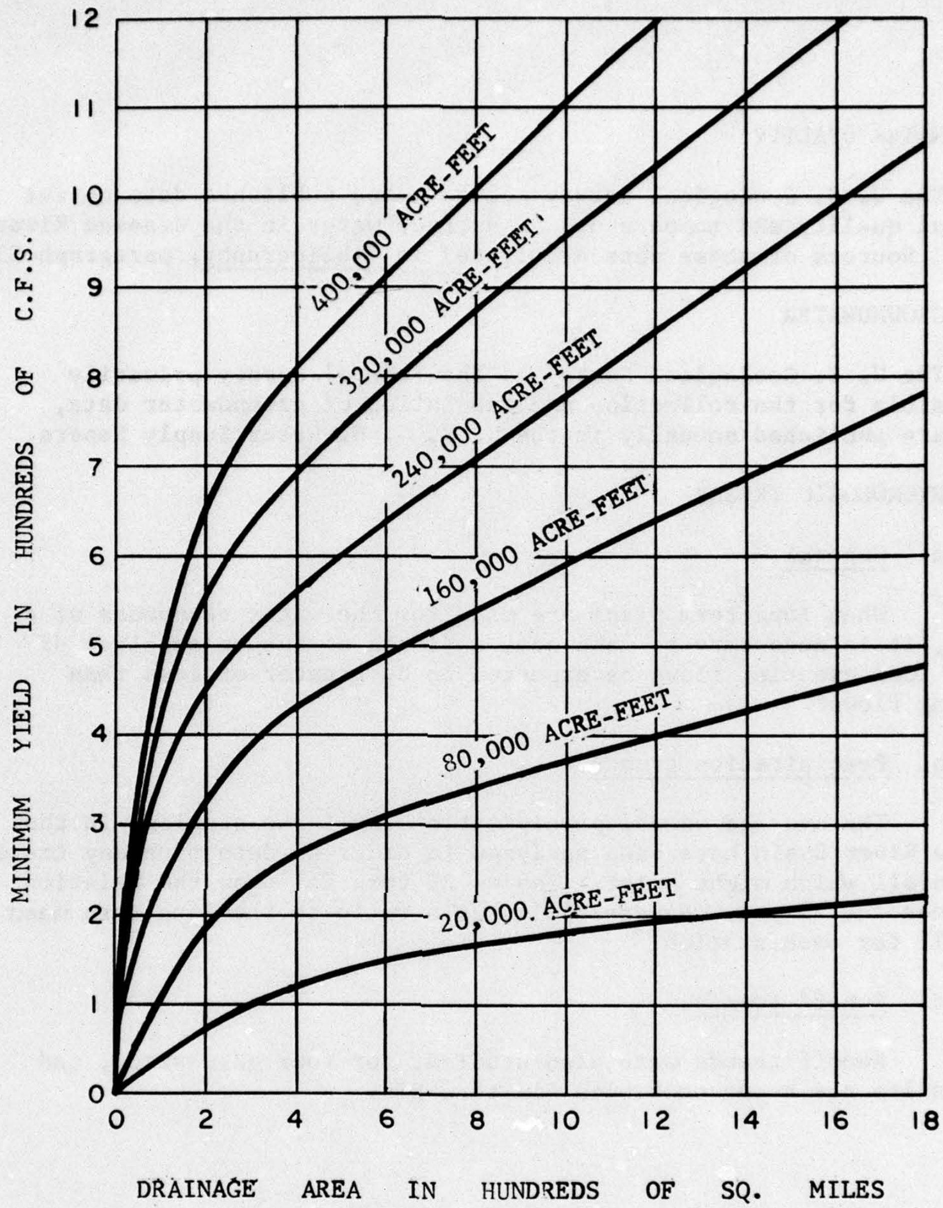
MINIMUM YIELD vs. DRAINAGE AREA

10-YEAR RECURRENCE INTERVAL

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E17



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

MINIMUM YIELD vs. DRAINAGE AREA

20-YEAR RECURRENCE INTERVAL

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E18

28. WATER QUALITY

The U. S. Geological Survey collects and publishes data on the chemical quality and temperature of surface water in the Genesee River Basin. Sources of these data are listed in Bibliography, paragraph E35.

29. GROUNDWATER

The U. S. Geological Survey is the Federal agency primarily responsible for the collection and tabulation of groundwater data, which are published annually in the U. S. G. S. Water Supply Papers.

30. HYDROLOGIC TRENDS

a. General.

When long-term plans are made for the water resources of a region, it is necessary to make some estimate of future supplies of water. Can existing flows be expected to be greater or less than existing flows?

b. Precipitation trends.

The average annual precipitation for three stations in the Genesee River Basin have been analyzed in order to determine any trends in rainfall which might exist. Tables E9 thru E11 show the relation of successive 20-year mean rainfalls as a ratio to the long term mean rainfall for each station.

c. Runoff trends.

Runoff trends were also studied, for four gage sites, and the results are shown on tables E12 thru E15.

TABLE E9

STATISTICS OF ANNUAL PRECIPITATION AT ANGELICA, N. Y.
1903 - 1906,1914,1917 - 1919,1926,1927,1944,1949,1951 ARE MISSING

NOTE - Q REFERS TO INPUT VARIABLE (DISCHARGE, ELEVATION, PRECIP., ETC.)

STATISTICS FOR SUCCESSIVE YEARS, FOR PERIOD INDICATED

20 YEAR INTERVALS

(RATIO = 20 YEAR MEAN OVER 52 YEAR MEAN)

PERIOD	N	M	S	Q 15.9	Q 50.0	Q 84.1	RATIO
1900 TO 1929	20	35.2575	4.2603	39.5	35.3	31.0	1.05
1901 TO 1930	20	34.8455	4.6199	39.5	34.8	30.2	1.04
1902 TO 1931	20	34.5920	4.3684	39.0	34.6	30.2	1.03
1907 TO 1932	20	34.3200	3.7670	38.1	34.3	30.6	1.02
1908 TO 1933	20	34.4585	3.6898	38.1	34.5	30.8	1.03
1909 TO 1934	20	33.9280	4.4971	38.4	33.9	29.4	1.01
1910 TO 1935	20	34.2325	4.3334	38.6	34.2	29.9	1.02
1911 TO 1936	20	33.9765	4.5152	38.5	34.0	29.5	1.01
1912 TO 1937	20	34.0425	4.5241	38.6	34.0	29.5	1.01
1913 TO 1938	20	33.8160	4.6925	38.5	33.8	29.1	1.01
1915 TO 1939	20	33.4885	4.8227	38.3	33.5	28.7	1.00
1916 TO 1940	20	33.1485	4.4962	37.6	33.1	28.7	0.99
1920 TO 1941	20	32.3765	5.0289	37.4	32.4	27.3	0.96
1921 TO 1942	20	32.8705	5.2660	38.1	32.9	27.6	0.98
1922 TO 1943	20	32.7990	5.2717	38.1	32.8	27.5	0.98
1923 TO 1945	20	33.2780	5.5586	38.8	33.3	27.7	0.99
1924 TO 1946	20	33.2465	5.5582	38.8	33.2	27.7	0.99
1925 TO 1947	20	33.1775	5.5166	38.7	33.2	27.7	0.99
1928 TO 1948	20	33.2755	5.5797	38.9	33.3	27.7	0.99
1929 TO 1950	20	33.4700	5.6516	39.1	33.5	27.8	1.00
1930 TO 1952	20	32.9360	5.4246	38.4	32.9	27.5	0.98
1931 TO 1953	20	33.3020	5.2654	38.6	33.3	28.0	0.99
1932 TO 1954	20	32.8890	5.3315	38.2	32.9	27.6	0.98
1933 TO 1955	20	32.5480	5.0442	37.6	32.5	27.5	0.97
1934 TO 1956	20	32.7495	5.1756	37.9	32.7	27.6	0.98
1935 TO 1957	20	32.9290	4.8720	37.8	32.9	28.1	0.98
1936 TO 1958	20	32.8955	4.8602	37.8	32.9	28.0	0.98
1937 TO 1959	20	33.2760	4.8005	38.1	33.3	28.5	0.99
1938 TO 1960	20	32.8140	5.0392	37.9	32.8	27.8	0.98
1939 TO 1961	20	33.2805	5.0419	38.3	33.3	28.2	0.99
1940 TO 1962	20	33.4640	4.9273	38.4	33.5	28.5	1.00
1941 TO 1963	20	33.0860	5.1550	38.2	33.1	27.9	0.99
1942 TO 1964	20	33.3655	4.6439	38.0	33.4	28.7	0.99

TABLE E10

STATISTICS OF ANNUAL PRECIPITATION AT DANSVILLE, N. Y.
1934, 1939 - 1942 ARE MISSING

NOTE - Q REFERS TO INPUT VARIABLE (DISCHARGE, ELEVATION, PRECIP., ETC.)

STATISTICS FOR SUCCESSIVE YEARS, FOR PERIOD INDICATED

20 YEAR INTERVALS

(RATIO = 20 YEAR MEAN OVER 37 YEAR MEAN)

PERIOD			N	M	S	Q 15.9	Q 50.0	Q 84.1	RATIO
1921	TO	1947	20	28.4680	5.1959	33.7	28.5	23.3	0.96
1922	TO	1948	20	29.0015	5.0289	34.0	29.0	24.0	0.98
1923	TO	1949	20	28.9220	5.0868	34.0	28.9	23.8	0.98
1924	TO	1950	20	29.7945	4.7867	34.6	29.8	25.0	1.01
1925	TO	1951	20	29.8845	4.8572	34.7	29.9	25.0	1.01
1926	TO	1952	20	29.9555	4.8690	34.8	30.0	25.1	1.01
1929	TO	1953	20	30.2140	4.8185	35.0	30.2	25.4	1.02
1930	TO	1954	20	30.0675	4.7811	34.8	30.1	25.3	1.01
1931	TO	1955	20	30.3050	4.4535	34.8	30.3	25.9	1.02
1932	TO	1956	20	30.8880	4.6560	35.5	30.9	26.2	1.04
1933	TO	1957	20	31.0380	4.5416	35.6	31.0	26.5	1.05
1935	TO	1958	20	31.5245	4.2351	35.8	31.5	27.3	1.06
1936	TO	1959	20	31.7245	4.4012	36.1	31.7	27.3	1.07
1937	TO	1960	20	31.8420	4.2357	36.1	31.8	27.6	1.07
1938	TO	1961	20	32.1070	4.4229	36.5	32.1	27.7	1.08
1943	TO	1962	20	32.0270	4.5099	36.5	32.0	27.5	1.08
1944	TO	1963	20	31.8190	4.7109	36.5	31.8	27.1	1.07
1945	TO	1964	20	31.5065	4.9265	36.4	31.5	26.6	1.06

TABLE E11

STATISTICS OF ANNUAL PRECIPITATION AT AVON, N. Y.

1912,1919,1923,1924,1926,1927,1929,1934,1949 - 1954 ARE MISSING

NOTE - Q REFERS TO INPUT VARIABLE (DISCHARGE, ELEVATION, PRECIP., ETC.)

STATISTICS FOR SUCCESSIVE YEARS, FOR PERIOD INDICATED

20 YEAR INTERVALS

(RATIO = 20 YEAR MEAN OVER 50 YEAR MEAN)

PERIOD			N	M	S	Q 15.9	Q 50.0	Q 84.1	RATIO
1900	TO	1921	20	28.7245	3.7099	32.4	28.7	25.0	0.98
1900	TO	1922	20	28.5575	3.7985	32.4	28.6	24.8	0.97
1902	TO	1925	20	28.7550	4.0751	32.8	28.8	24.7	0.98
1903	TO	1928	20	28.5770	4.2075	32.8	28.6	24.4	0.97
1904	TO	1930	20	28.3715	4.2367	32.6	28.4	24.1	0.97
1905	TO	1931	20	27.9625	4.0344	32.0	28.0	23.9	0.95
1906	TO	1932	20	28.1715	4.2284	32.4	28.2	23.9	0.96
1907	TO	1933	20	27.4750	4.1085	31.6	27.5	23.4	0.93
1908	TO	1935	20	27.6185	4.1737	31.8	27.6	23.4	0.94
1909	TO	1936	20	27.8195	4.1955	32.0	27.8	23.6	0.95
1910	TO	1937	20	28.4930	4.5783	33.1	28.5	23.9	0.97
1911	TO	1938	20	28.3550	4.4657	32.8	28.4	23.9	0.96
1913	TO	1939	20	28.5430	4.3526	32.9	28.5	24.2	0.97
1914	TO	1940	20	28.9440	4.8608	33.8	28.9	24.1	0.98
1915	TO	1941	20	28.6310	4.9553	33.6	28.6	23.7	0.97
1916	TO	1942	20	29.4010	5.4587	34.9	29.4	23.9	1.00
1917	TO	1943	20	29.4125	5.4622	34.9	29.4	24.0	1.00
1918	TO	1944	20	29.4625	5.4967	35.0	29.5	24.0	1.00
1920	TO	1945	20	30.4010	6.0090	36.4	30.4	24.4	1.03
1921	TO	1946	20	30.5705	5.8908	36.5	30.6	24.7	1.04
1922	TO	1947	20	31.0070	5.7851	36.8	31.0	25.2	1.06
1925	TO	1948	20	31.2085	5.6360	36.8	31.2	25.6	1.06
1928	TO	1955	20	30.9515	5.5284	36.5	31.0	25.4	1.05
1930	TO	1956	20	31.3815	5.2851	36.7	31.4	26.1	1.07
1931	TO	1957	20	31.5065	5.1758	36.7	31.5	26.3	1.07
1932	TO	1959	20	31.6655	5.0456	36.7	31.7	26.6	1.08
1933	TO	1960	20	31.1150	5.3894	36.5	31.1	25.7	1.06
1935	TO	1961	20	31.3885	5.0029	36.4	31.4	26.4	1.07
1936	TO	1962	20	31.5295	5.0242	36.6	31.5	26.5	1.07
1937	TO	1963	20	31.0250	5.6380	36.7	31.0	25.4	1.06
1938	TO	1964	20	30.2240	5.8400	36.1	30.2	24.4	1.03

TABLE E12

CANASERAGA CR. NEAR DANSVILLE, N.Y.
FREQUENCY AND STATISTICS OF AVERAGE YEARLY FLOWS 1911 - 1964
D.A. = 153.00 SQ. MI.

NOTE - Q REFERS TO INPUT VARIABLE (DISCHARGE, ELEVATION, PRECIP., ETC.)

STATISTICS FOR SUCCESSIVE YEARS, FOR PERIOD INDICATED

20 YEAR INTERVALS

(RATIO = 20 YEAR MEAN OVER 49 YEAR MEAN)

PERIOD	N	M	S	Q 15.9	Q 50.0	Q 84.1	RATIO
1911 TO 1935	20	2.1614	0.1226	192.3	145.0	109.3	0.99
1912 TO 1936	20	2.1659	0.1231	194.5	146.5	110.4	1.00
1916 TO 1937	20	2.1606	0.1208	191.1	144.7	109.6	0.99
1918 TO 1938	20	2.1430	0.1017	175.6	139.0	110.0	0.95
1919 TO 1939	20	2.1412	0.1007	174.5	138.4	109.8	0.94
1921 TO 1940	20	2.1436	0.1015	175.9	139.2	110.2	0.95
1922 TO 1941	20	2.1479	0.0986	176.4	140.6	112.0	0.96
1923 TO 1942	20	2.1457	0.0975	175.1	139.9	111.7	0.95
1924 TO 1943	20	2.1567	0.1047	182.6	143.5	112.7	0.98
1925 TO 1944	20	2.1540	0.1059	182.0	142.6	111.7	0.97
1926 TO 1945	20	2.1671	0.1083	188.5	146.9	114.5	1.00
1927 TO 1946	20	2.1707	0.1086	190.2	148.1	115.4	1.01
1928 TO 1947	20	2.1760	0.1142	195.1	150.0	115.3	1.02
1929 TO 1948	20	2.1647	0.1063	186.6	146.1	114.4	1.00
1930 TO 1949	20	2.1484	0.1098	181.3	140.8	109.3	0.96
1931 TO 1950	20	2.1463	0.1096	180.3	140.1	108.8	0.95
1932 TO 1951	20	2.1635	0.1123	188.7	145.7	112.5	0.99
1933 TO 1952	20	2.1658	0.1123	189.7	146.5	113.1	1.00
1934 TO 1953	20	2.1712	0.1085	190.4	148.3	115.5	1.01
1935 TO 1954	20	2.1793	0.0946	187.9	151.1	121.5	1.03
1936 TO 1955	20	2.1706	0.1028	187.7	148.1	116.9	1.01
1937 TO 1956	20	2.1770	0.1096	193.4	150.3	116.8	1.02
1938 TO 1957	20	2.1792	0.1097	194.5	151.1	117.4	1.03
1939 TO 1958	20	2.1789	0.1100	194.5	151.0	117.2	1.03
1940 TO 1959	20	2.1786	0.1101	194.4	150.9	117.1	1.03
1941 TO 1960	20	2.1853	0.1153	199.8	153.2	117.5	1.04
1942 TO 1961	20	2.1874	0.1145	200.4	154.0	118.3	1.05
1943 TO 1962	20	2.1798	0.1207	199.7	151.3	114.6	1.03
1944 TO 1963	20	2.1660	0.1190	192.8	146.6	111.4	1.00
1945 TO 1964	20	2.1701	0.1174	193.9	147.9	112.9	1.01

TABLE E13

GENESEE R. AT DRIVING PARK AVE., ROCHESTER, N.Y. D.A. 2467 SQ MI (2450 BEFORE 1921) FREQUENCY AND STASTICS OF AVERAGE YEARLY FLOWS 1906 - 1964

D.A. = 2467.00 SQ. MI.

NOTE - Q REFERS TO INPUT VARIABLE (DISCHARGE, ELEVATION, PRECIP., ETC.)

STATISTICS FOR SUCCESSIVE YEARS, FOR PERIOD INDICATED

20 YEAR INTERVALS

(RATIO = 20 YEAR MEAN OVER 56 YEAR MEAN)

PERIOD		N	M	S	Q 15.9	Q 50.0	Q 84.1	RATIO
1906 TO	1927	20	3.4022	0.0805	3038.3	2524.5	2097.5	0.96
1907 TO	1928	20	3.4190	0.0878	3212.1	2624.5	2144.3	1.00
1908 TO	1929	20	3.4226	0.0908	3261.6	2645.9	2146.5	1.01
1909 TO	1930	20	3.4195	0.0877	3215.7	2627.6	2147.0	1.00
1910 TO	1931	20	3.4178	0.0898	3217.8	2616.9	2128.3	1.00
1911 TO	1932	20	3.4242	0.0884	3255.2	2655.9	2166.9	1.01
1912 TO	1933	20	3.4256	0.0876	3259.7	2664.3	2177.6	1.02
1913 TO	1934	20	3.4173	0.0969	3267.0	2613.8	2091.2	1.00
1914 TO	1935	20	3.4136	0.0969	3240.1	2591.9	2073.4	0.99
1915 TO	1936	20	3.4154	0.0972	3255.2	2602.3	2080.4	0.99
1916 TO	1937	20	3.4235	0.0931	3285.6	2651.7	2140.0	1.01
1917 TO	1938	20	3.4136	0.0841	3145.2	2591.7	2135.6	0.99
1918 TO	1939	20	3.4162	0.0825	3152.8	2607.5	2156.6	0.99
1921 TO	1940	20	3.4171	0.0826	3159.5	2612.5	2160.3	1.00
1922 TO	1941	20	3.4177	0.0820	3160.0	2616.3	2166.1	1.00
1923 TO	1942	20	3.4191	0.0820	3170.0	2624.7	2173.2	1.00
1924 TO	1943	20	3.4333	0.0893	3330.9	2711.8	2207.8	1.03
1925 TO	1944	20	3.4305	0.0898	3313.7	2694.6	2191.2	1.03
1926 TO	1945	20	3.4385	0.0919	3391.9	2745.0	2221.5	1.05
1927 TO	1946	20	3.4431	0.0941	3445.2	2774.3	2234.0	1.06
1928 TO	1947	20	3.4481	0.0990	3524.7	2806.2	2234.1	1.07
1929 TO	1948	20	3.4392	0.0910	3389.8	2749.0	2229.4	1.05
1930 TO	1949	20	3.4282	0.0927	3318.1	2680.2	2164.9	1.02
1931 TO	1950	20	3.4242	0.0921	3283.7	2655.9	2148.2	1.01
1932 TO	1951	20	3.4373	0.0926	3387.2	2736.9	2211.5	1.04
1933 TO	1952	20	3.4323	0.0936	3356.3	2705.7	2181.1	1.03
1934 TO	1953	20	3.4321	0.0937	3355.8	2704.9	2180.2	1.03
1935 TO	1955	20	3.4360	0.0866	3331.6	2729.3	2235.8	1.04
1936 TO	1956	20	3.4485	0.0953	3497.9	2808.9	2255.7	1.07
1937 TO	1957	20	3.4479	0.0953	3493.3	2804.9	2252.2	1.07
1938 TO	1958	20	3.4419	0.0985	3471.0	2766.5	2205.0	1.05
1939 TO	1959	20	3.4441	0.0979	3483.4	2780.1	2218.8	1.06
1940 TO	1960	20	3.4522	0.1003	3568.9	2833.0	2248.8	1.08
1941 TO	1961	20	3.4500	0.1012	3558.2	2818.3	2232.2	1.07
1942 TO	1962	20	3.4440	0.1103	3583.5	2779.7	2156.2	1.06
1943 TO	1963	20	3.4385	0.1137	3566.0	2744.6	2112.4	1.05
1944 TO	1964	20	3.4251	0.1081	3413.2	2661.4	2075.2	1.01

TABLE E14

GENESEE R. AT PORTAGEVILLE, N.Y.
FREQUENCY AND STATISTICS OF AVERAGE YEARLY FLOWS 1908 - 1964
D.A. = 982.00 SQ. MI.

NOTE - Q REFERS TO INPUT VARIABLE (DISCHARGE, ELEVATION, PRECIP., ETC.)

STATISTICS FOR SUCCESSIVE YEARS, FOR PERIOD INDICATED
20 YEAR INTERVALS

(RATIO = 20 YEAR MEAN OVER 56 YEAR MEAN)

PERIOD		N	M	S	Q 15.9	Q 50.0	Q 84.1	RATIO
1908 TO	1928	20	3.0833	0.0930	1500.8	1211.4	977.8	1.02
1910 TO	1929	20	3.0907	0.0941	1530.2	1232.2	992.2	1.04
1911 TO	1930	20	3.0912	0.0940	1531.7	1233.7	993.7	1.04
1912 TO	1931	20	3.0823	0.1035	1534.0	1208.7	952.3	1.02
1913 TO	1932	20	3.0803	0.1030	1524.9	1203.0	949.0	1.02
1914 TO	1933	20	3.0713	0.1033	1495.0	1178.4	928.9	1.00
1915 TO	1934	20	3.0615	0.1106	1486.2	1152.1	893.1	0.97
1916 TO	1935	20	3.0619	0.1106	1487.6	1153.2	893.9	0.97
1917 TO	1936	20	3.0494	0.0940	1391.3	1120.5	902.4	0.95
1918 TO	1937	20	3.0498	0.0943	1393.5	1121.4	902.4	0.95
1919 TO	1938	20	3.0455	0.0935	1377.4	1110.5	895.3	0.94
1920 TO	1939	20	3.0428	0.0929	1366.6	1103.5	891.1	0.93
1921 TO	1940	20	3.0509	0.0927	1391.8	1124.3	908.3	0.95
1922 TO	1941	20	3.0539	0.0905	1394.3	1132.1	919.2	0.96
1923 TO	1942	20	3.0527	0.0900	1389.1	1129.0	917.7	0.95
1924 TO	1943	20	3.0699	0.0943	1459.6	1174.7	945.5	0.99
1925 TO	1944	20	3.0649	0.0960	1448.6	1161.3	931.0	0.98
1926 TO	1945	20	3.0763	0.0963	1487.9	1192.1	955.1	1.01
1927 TO	1946	20	3.0807	0.0983	1510.1	1204.3	960.5	1.02
1928 TO	1947	20	3.0837	0.1013	1531.3	1212.7	960.3	1.02
1929 TO	1948	20	3.0765	0.0961	1487.9	1192.5	955.8	1.01
1930 TO	1949	20	3.0651	0.0975	1454.1	1161.6	928.0	0.98
1931 TO	1950	20	3.0640	0.0975	1450.3	1158.7	925.8	0.98
1932 TO	1951	20	3.0804	0.0955	1499.3	1203.3	965.8	1.02
1933 TO	1952	20	3.0825	0.0961	1508.9	1209.3	969.2	1.02
1934 TO	1953	20	3.0863	0.0934	1512.5	1219.7	983.6	1.03
1935 TO	1954	20	3.0921	0.0839	1499.7	1236.2	1019.0	1.04
1936 TO	1955	20	3.0838	0.0940	1505.7	1212.8	976.8	1.02
1937 TO	1956	20	3.0941	0.1022	1571.7	1242.0	981.5	1.05
1938 TO	1957	20	3.0929	0.1019	1566.0	1238.5	979.6	1.05
1939 TO	1958	20	3.0934	0.1015	1566.6	1240.0	981.5	1.05
1940 TO	1959	20	3.0963	0.1007	1574.1	1248.3	989.9	1.05
1941 TO	1960	20	3.1007	0.1040	1602.1	1261.0	992.6	1.07
1942 TO	1961	20	3.1028	0.1027	1604.8	1267.0	1000.3	1.07
1943 TO	1962	20	3.0933	0.1136	1610.5	1239.7	954.3	1.05
1944 TO	1963	20	3.0754	0.1151	1550.4	1189.5	912.6	1.01
1945 TO	1964	20	3.0768	0.1141	1552.0	1193.6	917.9	1.01

TABLE E15

GENESEE RIVER AT SCIO, N.Y.
FREQUENCY AND STATISTICS OF AVERAGE YEARLY FLOWS 1917 - 1964
D.A. = 309.00 SQ. MI.

NOTE - Q REFERS TO INPUT VARIABLE (DISCHARGE, ELEVATION, PRECIP., ETC.)

STATISTICS FOR SUCCESSIVE YEARS, FOR PERIOD INDICATED

20 YEAR INTERVALS

(RATIO = 20 YEAR MEAN OVER 48 YEAR MEAN)

PERIOD	N	M	S	Q 15.9	Q 50.0	Q 84.1	RATIO
1917 TO 1936	20	2.5580	0.1080	463.5	361.4	281.8	0.97
1918 TO 1937	20	2.5593	0.1090	465.9	362.5	282.1	0.98
1919 TO 1938	20	2.5503	0.1019	449.0	355.1	280.8	0.96
1920 TO 1939	20	2.5411	0.1016	439.3	347.6	275.1	0.94
1921 TO 1940	20	2.5457	0.1020	444.3	351.3	277.8	0.95
1922 TO 1941	20	2.5444	0.1036	444.6	350.3	276.0	0.94
1923 TO 1942	20	2.5445	0.1036	444.8	350.4	276.0	0.94
1924 TO 1943	20	2.5601	0.1092	466.9	363.1	282.4	0.98
1925 TO 1944	20	2.5544	0.1116	463.5	358.4	277.2	0.97
1926 TO 1945	20	2.5668	0.1167	482.5	368.8	281.9	0.99
1927 TO 1946	20	2.5771	0.1198	497.6	377.7	286.7	1.02
1928 TO 1947	20	2.5800	0.1222	503.8	380.2	286.9	1.02
1929 TO 1948	20	2.5703	0.1129	482.1	371.8	286.7	1.00
1930 TO 1949	20	2.5582	0.1138	469.9	361.6	278.3	0.97
1931 TO 1950	20	2.5583	0.1138	470.0	361.7	278.3	0.97
1932 TO 1951	20	2.5759	0.1166	492.7	376.7	288.0	1.02
1933 TO 1952	20	2.5836	0.1183	503.3	383.3	292.0	1.03
1934 TO 1953	20	2.5884	0.1140	504.0	387.6	298.1	1.04
1935 TO 1954	20	2.5938	0.1067	501.8	392.5	307.0	1.06
1936 TO 1955	20	2.5833	0.1159	500.2	383.1	293.4	1.03
1937 TO 1956	20	2.5916	0.1236	519.1	390.5	293.8	1.05
1938 TO 1957	20	2.5902	0.1231	516.7	389.2	293.1	1.05
1939 TO 1958	20	2.5928	0.1226	519.3	391.6	295.3	1.06
1940 TO 1959	20	2.5996	0.1183	522.3	397.7	302.9	1.07
1941 TO 1960	20	2.6044	0.1201	530.3	402.2	305.0	1.08
1942 TO 1961	20	2.6095	0.1135	528.5	407.0	313.4	1.10
1943 TO 1962	20	2.5971	0.1269	529.6	395.4	295.3	1.07
1944 TO 1963	20	2.5823	0.1261	511.0	382.2	285.9	1.03
1945 TO 1964	20	2.5858	0.1233	511.8	385.3	290.1	1.04

d. Conclusions.

From the small variation in precipitation and runoff for the stations studied, it seems that future precipitation and runoff values will not show any marked upward or downward trends.

HYDROLOGIC DESIGN CRITERIA

31. RESERVOIR DESIGN CRITERIA

a. Tailwaters.

Tailwater curves for considered reservoir sites were developed using Manning's equation for the valley section just downstream of each considered reservoir. The spillways and stilling basins were then designed so that the determined tailwater for the spillway design flood would be sufficient to cause the hydraulic pump to dissipate the energy.

b. Design Storms.

The maximum probable precipitation amounts as determined from U. S. Weather Bureau Hydrometeorological Report 33 were used to determine rainfall for calculating the Spillway Design Floods for each considered reservoir.

c. Design Floods.

To determine Spillway Design Floods, unit graphs were determined for reservoir conditions at each considered damsite. The peaks of these unit graphs were increased by 25 percent, and the maximum probable rainfall (decreased by appropriate losses) was applied to each unit graph to develop Spillway Design Flood hydrographs. Losses were taken as .5 inches initial loss and .05 inches per hour infiltration.

32. CHANNEL DESIGN CRITERIA

For those channels through urban reaches within a sub-watershed the 100 year frequency flow was used for design criteria. For agricultural reaches the 5 year frequency was used. These frequency flows were determined by routing sub-areas above the damage reach to the reach for sub-watersheds 1 through 11. In sub-watershed 18 the channel was designed to carry a discharge based upon "C" drainage criteria of the Soil Conservation Service and also the 5-year design discharge based upon regional analysis procedures. In the lower Canaseraga Creek, 9000 cfs was used as a limiting outflow discharge, since flows significantly higher would begin to cause damage in the village of Avon on the Genesee River.

33. ACKNOWLEDGEMENTS

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New York State Conservation Department
U. S. Corps of Engineers
U. S. Forest Service
U. S. Geological Survey
U. S. Soil Conservation Service
U. S. Weather Bureau

34. GLOSSARY OF TERMS

ACRE-FOOT. A unit for measuring the volume of water, is equal to the quantity of water required to cover 1 acre to a depth of 1 foot and is equal to 43,560 cubic feet or 325,851 gallons. The term is commonly used in measuring volumes of water used or stored.

ANNUAL FLOOD. The highest peak discharge in a water year.

BASIC HYDROLOGIC DATA. Includes inventories of features of land and water that vary only from place to place (topographic and geologic maps are examples), and records of processes that vary with both place and time. (Records of precipitation, streamflow, ground-water, and quality-of-water analyses are examples.)

Basic hydrologic information is a broader term that includes surveys of the water resources of particular areas and a study of their physical and related economic processes, interrelations and mechanisms.

CFS. Abbreviation of cubic feet per second.

CFSM (cubic feet per second per square mile). The average number of cubic feet of water per second flowing from each square mile of area drained by a stream, assuming that the runoff is distribuated uniformly in time and area.

CHANNEL (watercourse). An open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. River, creek, run, branch, anabranch, and tributary are some of the terms used to describe natural channels.

CLIMATE. The sum total of the meteorological elements that characterize the average and extreme condition of the atmosphere over a long period of time at any one place or region of the earth's

surface. The collective state of the atmosphere at a given place or over a given area within a specified period of time.

CORRELATION. The process of establishing a relation between a variable and one or more related variables. Correlation is simple if there is only one independent variable; multiple, if there is more than one independent variable.

CUBIC FEET PER SECOND. A unit expressing rates of discharge. One cubic foot per second is equal to the discharge of a stream of rectangular cross section, 1 foot wide and 1 foot deep, flowing water at an average velocity of 1 foot per second.

DISCHARGE. In its simplest concept discharge means outflow; therefore, the use of this term is not restricted as to course of location, and it can be applied to describe the flow of water from a pipe or from a drainage basin. If the discharge occurs in some course or channel, it is correct to speak of the discharge of a canal or of a river. It is also correct to speak of the discharge of a canal or stream into a lake, a stream, or an ocean.

DRAINAGE AREA. The drainage area of a stream is that area, measured in a horizontal plane, which is enclosed by a drainage divide.

DRAINAGE BASIN. A part of the surface of the earth that is occupied by a drainage system, which consists of a surface or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

DROUGHT. A period of deficient precipitation or runoff extending over an indefinite number of days, but with no set standard by which to determine the amount of deficiency needed to constitute a drought. Thus, there is no universally accepted quantitative definition of drought; generally, each investigator establishes his own definition.

The following paragraph discusses the problem of defining a drought:

When in an area that is ordinarily classed as humid, natural vegetation becomes desiccated or defoliates unseasonably and crops fail to mature owing to lack of precipitation, or when precipitation is insufficient to meet the needs of established human activities, drought conditions may be said to prevail. Although water for irrigation or other uses in arid areas is always limited, special shortages in such areas are also regarded as droughts. Unsatisfactory distribution of precipitation throughout the year may be as effective a factor in causing a drought as a shortage in the total amount.

Temperature and wind may also play an important part, especially in relation to the damage done.

EVAPOTRANSPIRATION. Water withdrawn from a land area by evaporation from water surfaces and moist soil and plant transpiration.

FLOOD. An overflow or inundation that comes from a river or other body of water and causes or threatens damage.

Any relatively high streamflow overtopping the natural or artificial banks in any reach of a stream.

A relatively high flow as measured by either gage height or discharge quantity.

FLOOD-FREQUENCY CURVE. 1. A graph showing the number of times per year on the average, plotted as abscissa, that floods of magnitude, indicated by the ordinate, are equaled or exceeded. 2. A similar graph but with recurrence intervals of floods plotted as abscissa.

FLOOD, MAXIMUM PROBABLE. The largest floor for which there is any reasonable expectancy in this climatic era.

FLOOD PEAK. The highest value of the stage or discharge attained by a flood; thus, peak stage or peak discharge. Flood crest has nearly the same meaning, but since it connotes the top of the flood wave, it is properly used only in referring to stage-thus, crest stage, but not crest discharge.

FLOOD PLAIN. A strip of relatively smooth land bordering a stream, built of sediment carried by the stream and dropped in the slack water beyond the influence of the swiftest current. It is called a living flood plain if it is overflowed in times of highwater; but a fossil flood plain if it is beyond the reach of the highest flood.

FLOOD STAGE. The gage height of the lowest bank of the reach in which the gage is situated. The term "lowest bank" is, however, not to be taken to mean an unusually low place or break in the natural bank through which the water inundates an unimportant and small area.

FLOW-DURATION CURVE. A cumulative frequency curve that shows the percentage of time that specified discharges are equaled or exceeded.

GAGE HEIGHT. The water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term stage although gage height is more appropriate when used with a reading on a gage.

GAGING STATION. A particular site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained.

GROUND WATER. Water in the ground that is in the zone of saturation, from which wells, springs, and ground-water runoff are supplied.

HYDROGRAPH. A graph showing stage, flow, velocity, or other property of water with respect to time.

HYDROLOGY. The science treating of the waters of the earth, their occurrence, distribution, and movements.

ISOHYET. See Isohyetal line.

ISOHYETAL LINE (isohyet). A line drawn on a map or chart joining points that receive the same amount of precipitation.

LOW-FLOW FREQUENCY CURVE. A graph showing the magnitude and frequency of minimum flows for a period of given length. Frequency is usually expressed as the average interval, in years, between recurrences of an annual minimum flow equal to or less than that shown by the magnitude scale.

MEANDER. The winding of a stream channel.

PARTIAL-DURATION FLOOD SERIES. A list of all flood peaks that exceed a chosen base stage or discharge, regardless of the number of peaks occurring in a year.

PRECIPITATION. As used in hydrology, precipitation is the discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface. It is the common process by which atmospheric water becomes surface or subsurface water.

Precipitation includes rainfall, snow, hail, and sleet, and is therefore a more general term than rainfall.

RAIN. Liquid precipitation.

RAINFALL EXCESS. The volume of rainfall available for direct runoff.

REACH. 1. The length of channel uniform with respect to discharge, depth, area, and slope. 2. The length of a channel for which a single gage affords a satisfactory measure of the stage and discharge. 3. The length of a river between two gaging stations. 4. More generally, any length of a river.

RECURRENCE INTERVAL (return period). The average interval of time within which the given flood will be equaled or exceeded once.

REGIMEN OF A STREAM. The system or order characteristics of a stream; in other words, its habits with respect to velocity and volume, form of and changes in channel, capacity to transport sediment, and amount of material supplied for transportation.

REGULATION. The artificial manipulation of the flow of a stream.

RESERVOIR. A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.

RUNOFF. That part of the precipitation that appears in surface streams.

SECOND-FOOT. Same as cfs. This term is no longer used in published reports of the U. S. Geological Survey.

SNOW. A form of precipitation composed of ice crystals.

SOIL MOISTURE (Soil water). Water diffused in the soil, the upper part of the zone of aeration from which water is discharged by the transpiration of plants or by soil evaporation.

STAGE. The height of a water surface above an established datum plane; also gage height.

STAGE-DISCHARGE CURVE (rating curve). A graph showing the relation between the gage height, usually plotted as ordinate, and the amount of water flowing in a channel, expressed as volume per unit of time, plotted as abscissa.

STAGE-DISCHARGE RELATION. The relation expressed by the stage-discharge curve.

STORM. A disturbance of the ordinary average conditions of the atmosphere which, unless specifically qualified, may include any or all meteorological disturbances, such as wind, rain, snow, hail, or thunder.

STREAM. A general term for a body of flowing water. In hydrology the term is generally applied to the water flowing in a natural channel as distinct from a canal. More generally as in the term stream gaging, it is applied to the water flowing in any channel, natural or artificial.

STREAMFLOW. The discharge that occurs in a natural channel. Although the term discharge can be applied to the flow of a canal, the word streamflow uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than runoff, as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

STREAM GAGING. The process and art of measuring the depths, areas, velocities, and rates of flow in natural or artificial channels.

STREAM-GAGING STATION. A gaging station where a record of discharge of a stream is obtained. Within the Geological Survey this term is used only for those gaging stations where a continuous record of discharge is obtained.

TREND. A statistical term referring to the direction or rate of increase or decrease in magnitude of the individual members of a time series of data.

UNIT HYDROGRAPH. The hydrograph of direct runoff from a storm uniformly distributed over the drainage basin during a specified unit of time; the hydrograph is reduced in vertical scale to correspond to a volume of runoff of 1 inch from the drainage basin.

WATERSHED. An area within a high ridge line that collects and carries precipitation falling the area, to a common outflow point.

WATER YEAR. In Geological Survey reports dealing with surface-water supply, the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ended September 30, 1959, is called the "1959 water year."

35. BIBLIOGRAPHY

1. Thornthwaite, C. W.: Atlas of Climatic Types in the United States, 1900-1939. U. S. Dept. of Agriculture, Misc. Publication No. 421. 1941.

2. Klein, William H.: Principal Tracks and Mean Frequencies of Cyclones and Anticyclones in the Northern Hemisphere. U. S. Weather Bureau Research Paper No. 40. 1957.

3. Rothenberg, Leon: An Application of Synoptic Climatology to the Prediction of Great Lakes Snow Showers. Unpublished manuscript. 1964.

4. Booker, D. Ray: Modification of Convective Storms American Meteorological Society, Meteorological Monograph, Vol. 5, No. 27. 1963.

5. Williams, John M.: A Statistical Study of Extreme Snowfall Amounts at Rochester, N. Y. Unpublished manuscript. 1964.

6. Beard, L. R.: Statistical Methods in Hydrology. U. S. Army Engineer District, Sacramento. 1962.

7. Mockus, Victor: National Engineering Handbook, Section 4, Hydrology, Supplement A, "The Hydrology Guide", U. S. Soil Conservation Service, 1957.

8. Chow, V. T.(Editor): Handbook of applied Hydrology, McGraw Hill. 1964.

9. Robison, F. Luman: Maximum Known Discharges of New York Streams, N. Y. Water Resources Commission Bulletin No. 54, March 1965.

10. Gilbert, B. K., and Kammerer, J. C.: Summary of Water Resources Records at Principal Measurement Sites in the Genesee River Basin through 1963, N. Y. Water Resources Commission Bulletin No. 56, 1965.

11. Snyder, F. F.: Synthetic unit-graphs, Trans. Am. Geophys. Union, Vol. 65, pp. 447-454, 1938.

12. U. S. Corps of Engineers EM 1110-2-1405 Flood Hydrograph Analyses and Computations, 31 Aug. 1959.

13. Taylor, A. B., & Schwarz, H. E.: Unit-Hydrograph Lag and Peak Flow Related to Basin Characteristics, Trans. Am. Geophys. Union, Vol. 33, pp. 235-246, 1952.

14. U. S. Geological Survey: Compilation of records of surface waters of the United States through September 1950, Part 4, St. Lawrence River basin: U. S. Geol. Survey Water-Supply Paper 1307. 1958.

15. U. S. Geological Survey: Surface water supply of the United States, Part 4, St. Lawrence River basin, 1960: U. S. Geol. Survey Water-Supply Paper 1707. 1961. (This is the part of a long series of annual river-basin reports on streamflow and stage and contents of reservoirs. Tables on preceding pages contain numbers of earlier reports in this series.)

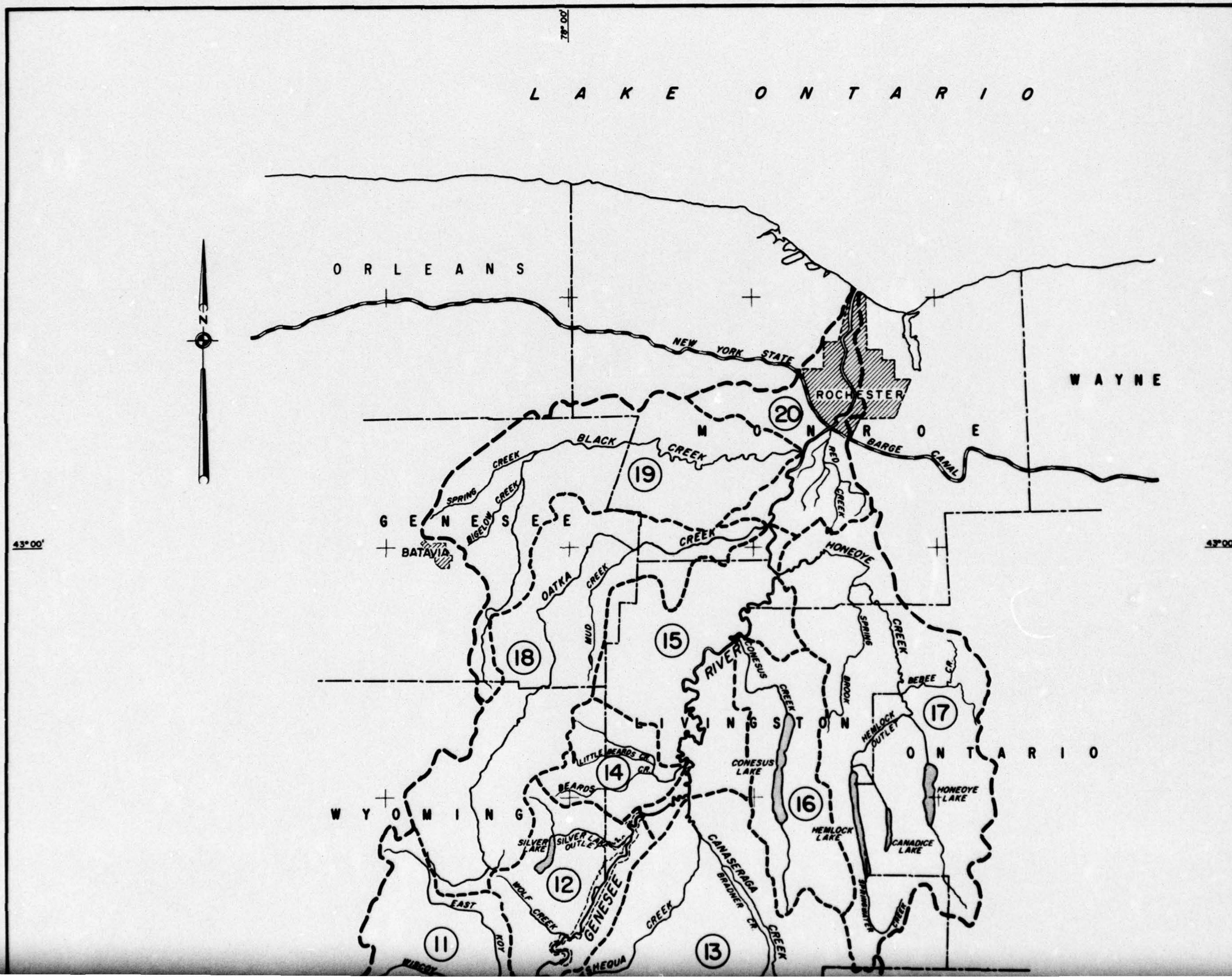
16. U. S. Geological Survey: Compilation of records of surface waters of the United States, October 1950 to September 1960, Part 4, St. Lawrence River basin: U. S. Geol. Survey Water-Supply Paper 1727. 1964.

17. U. S. Geological Survey: Quality of surface waters of the United States, Parts 3 and 4, Ohio River basin and St. Lawrence River basin, 1962: U. S. Geol. Survey Water-Supply Paper 1942. 1964. (This is the most recently published of an annual series of reports on chemical quality and temperature of streams.)

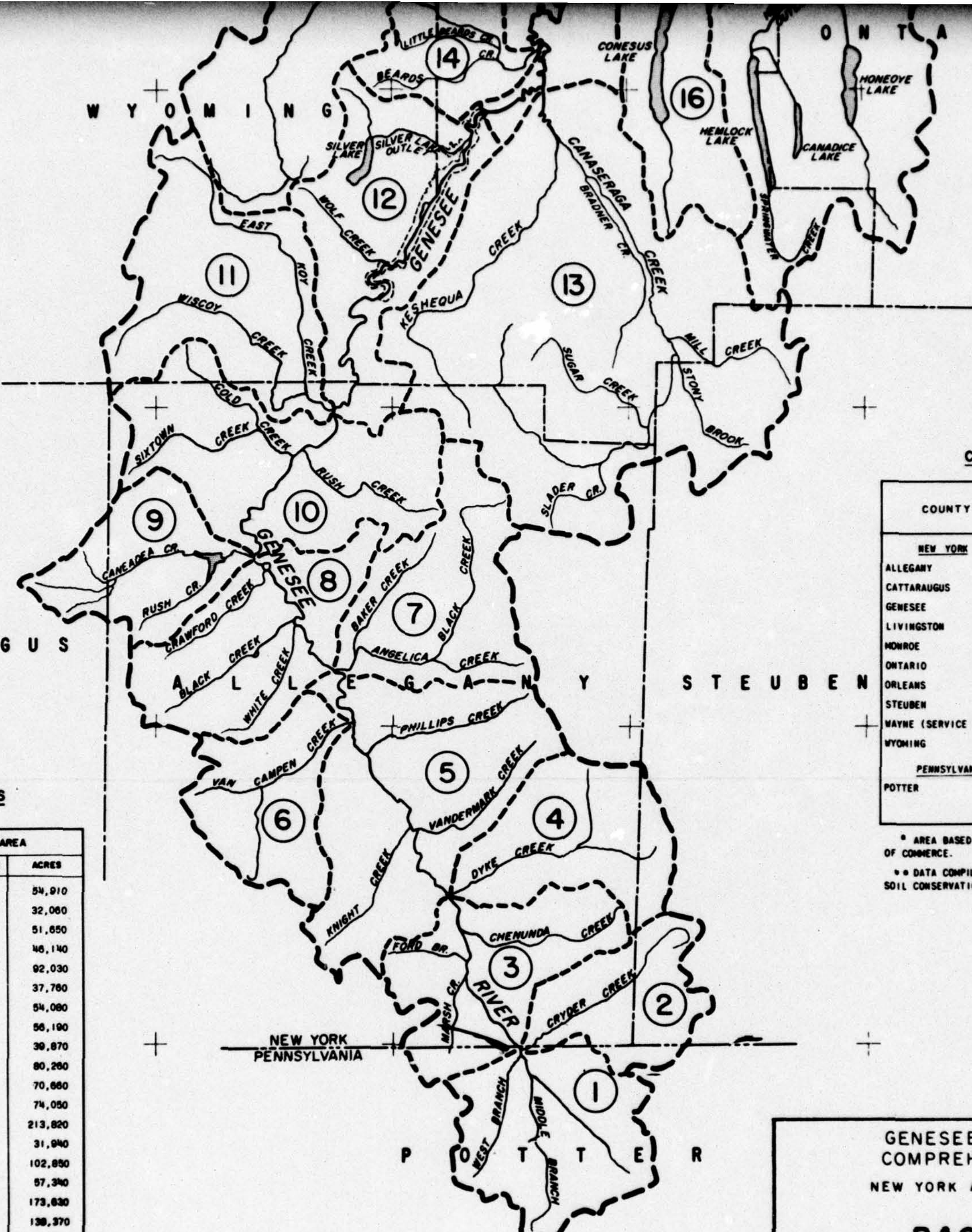
18. U. S. Geological Survey: Ground-water levels in the United States 1958-62, northeastern states: U. S. Geol. Survey Water-Supply Paper 1782. 1964.

Previous publications in this series which contain water-level data (by calendar years) for 2 or 3 wells in the Genesee River basin are as follows:

Water-Supply Paper	Year of water-level data	Water-Supply Paper	Year of water-level data
944	1942	1156	1949
986	1943	1165	1950
1016	1944	1191	1951
1023	1945	1221	1952
1071	1946	1265	1953
1096	1947	1321	1954
1126	1948	1404	1955
		1537	1956, 1957



78°00'
LAKE ONTARIO
ORLEANS
N
NEW YORK STATE
ROCHESTER
WAYNE
20
MONROE
BARGE CANAL
BLACK CREEK
RED CREEK
19
SPRING CREEK
BIGELOW CREEK
GENESEE
BATAVIA
43°00'
OATKA CREEK
MUD CREEK
HONEOYE
15
18
SPRING BROOK
CREEK
RIVER
CONESUS CREEK
BEBEE CR.
17
LIVINGSTON
HEMLOCK OUTLET
ONTARIO
LITTLE BEARDS CR.
14
CR.
BEARDS
CONESUS LAKE
16
HONEOYE LAKE
WYOMING
SILVER LAKE
SILVER LAKE OUTLET
HEMLOCK LAKE
CANADICE LAKE
12
CANASERAGA
WOLF CREEK
GENESEE
BRADNER CR.
SPRINGWATER
EAST KOY
CREEK
11
13
CREEK
SHEQUA



SUBWATERSHED AREAS

SUBWATERSHED		DRAINAGE AREA	
NUMBER	NAME	SQUARE MILES	ACRES
1	GENESEE - SOUTH	85.8	54,910
2	CRYDER CREEK	50.1	32,060
3	GENESEE - CHENUNDA	80.7	51,650
4	DYKE CREEK	72.1	46,140
5	GENESEE - VANDERMARK	143.8	92,030
6	VAN CAMPEN CREEK	59.0	37,760
7	ANGELICA CREEK	84.5	54,080
8	GENESEE - SOUTH BLACK	87.8	56,190
9	CANEADEA CREEK	62.3	39,870
10	GENESEE - COLD CREEK	125.4	80,260
11	WISCOY CREEK	110.4	70,660
12	SILVER LAKE OUTLET	115.7	74,050
13	CANASERAGA CREEK	334.1	213,820
14	BEARDS CREEK	49.9	31,940
15	GENESEE - GENESEO	160.7	102,850
16	CONESUS LAKE	89.6	57,340
17	HONEOYE CREEK	271.3	173,630
18	OATKA CREEK	216.2	138,370
19	BLACK CREEK	213.9	136,900
20	GENESEE - ROCHESTER	66.1	42,300
TOTAL		2,479.4	1,586,810

DATA COMPILED BY U.S. DEPARTMENT OF AGRICULTURE

COUNTY AREAS

COUNTY	TOTAL AREA OF COUNTY* SQ. MI.	AREA WITHIN GENESEE RIVER BASIN** SQ. MI.
NEW YORK		
ALLEGANY	1,048	769.8
CATTARAUGUS	1,335	14.0
GENESEE	501	202.6
LIVINGSTON	636	619.4
MONROE	673	248.6
ONTARIO	649	136.8
ORLEANS	396	4.0
STEUBEN	1,408	86.7
WAYNE (SERVICE AREA)	607	0
WYOMING	598	301.7
PENNSYLVANIA		
POTTER	1,090	95.8
		2,479.4

* AREA BASED ON 1960 U.S. CENSUS, U.S. DEPARTMENT OF COMMERCE.

** DATA COMPILED BY U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

BASIN MAP

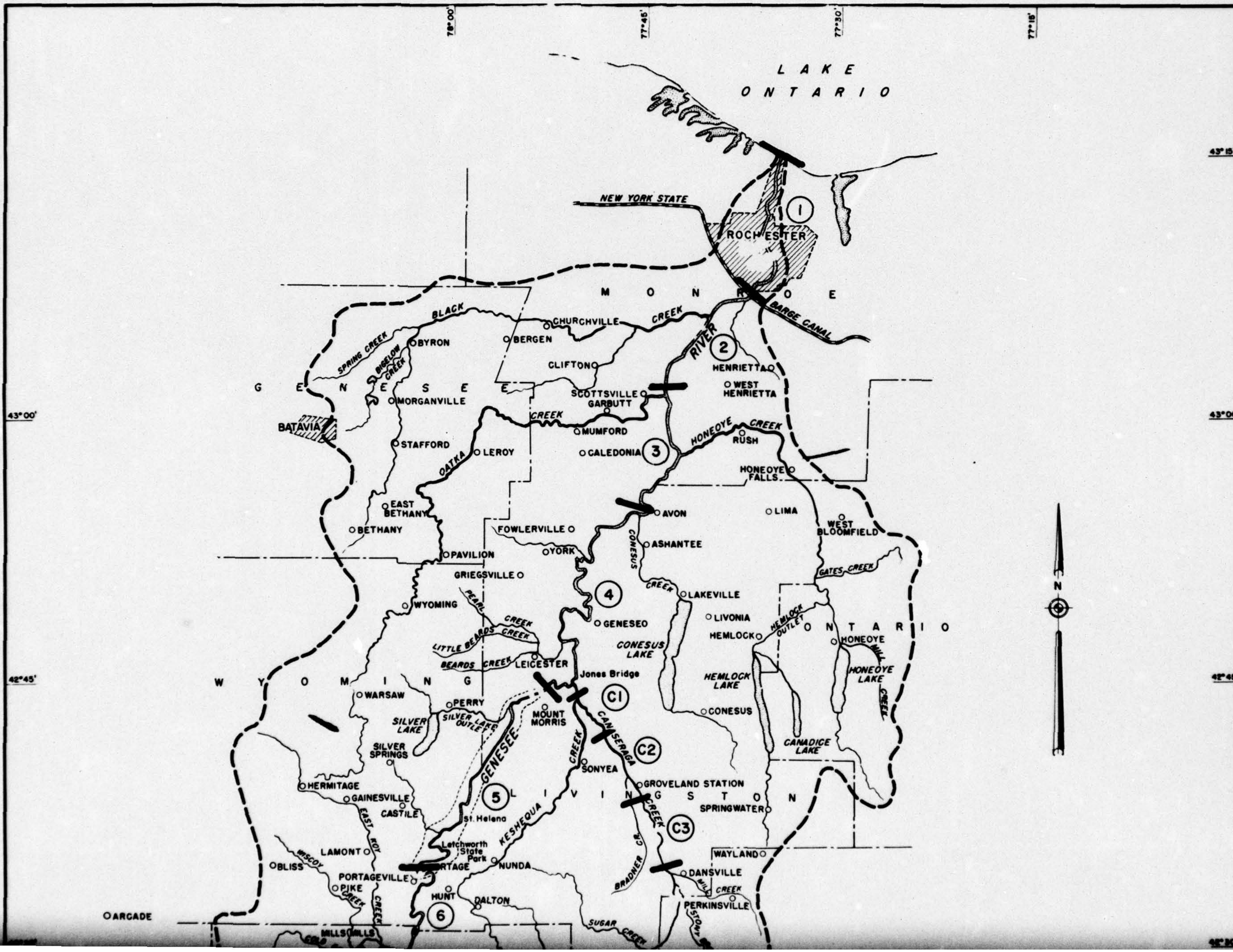
U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

2

PLATE E1

PLATE E1



LAKE ONTARIO
78°00'
77°45'
77°30'
77°15'
43°15'
43°00'
42°45'
42°30'
NEW YORK STATE
ROCHESTER
BARGE CANAL
MONROE
GENESEE
WYOMING
LIVINGSTON
ONTARIO
N
1
2
3
4
5
6
C1
C2
C3
RIVER
GENESEE
BLACK CREEK
SPRING CREEK
BIGELOW CREEK
OATKA CREEK
HONEOYE CREEK
CONESUS CREEK
CONESUS LAKE
HEMLOCK LAKE
HEMLOCK OUTLET
CANADICE LAKE
HONEOYE LAKE
MILL CREEK
GATES CREEK
PEARL CREEK
LITTLE BEARDS CREEK
BEARDS CREEK
SILVER LAKE
SILVER LAKE OUTLET
CANASERAGA CREEK
KESHEQUA CREEK
BRADNER CR.
SUGAR CREEK
EAST KOY CREEK
WISCOY
PIKE CREEK
CHURCHVILLE
BERGEN
BYRON
CLIFTON
SCOTTSVILLE
GARBUTT
MUMFORD
CALEDONIA
HENRIETTA
WEST HENRIETTA
RUSH
HONEOYE FALLS
LIMA
WEST BLOOMFIELD
BATAVIA
MORGANVILLE
STAFFORD
LEROY
EAST BETHANY
BETHANY
PAVILION
FOWLERVILLE
YORK
AVON
ASHANTEE
LAKEVILLE
LIVONIA
HEMLOCK
HONEOYE
GRIEGSVILLE
WYOMING
GENESEO
LEICESTER
Jones Bridge
MOUNT MORRIS
CONESUS
WARSAW
PERRY
SILVER SPRINGS
SONYEA
GROVELAND STATION
SPRINGWATER
HERMITAGE
GAINESVILLE
CASTILE
St. Helena
Letchworth State Park
PORTAGE
NUNDA
LAMONT
BLISS
PORTAGEVILLE
PIKE
HUNT
DALTON
WAYLAND
DANSVILLE
PERKINSVILLE
ARCADE
MILLS MILLS

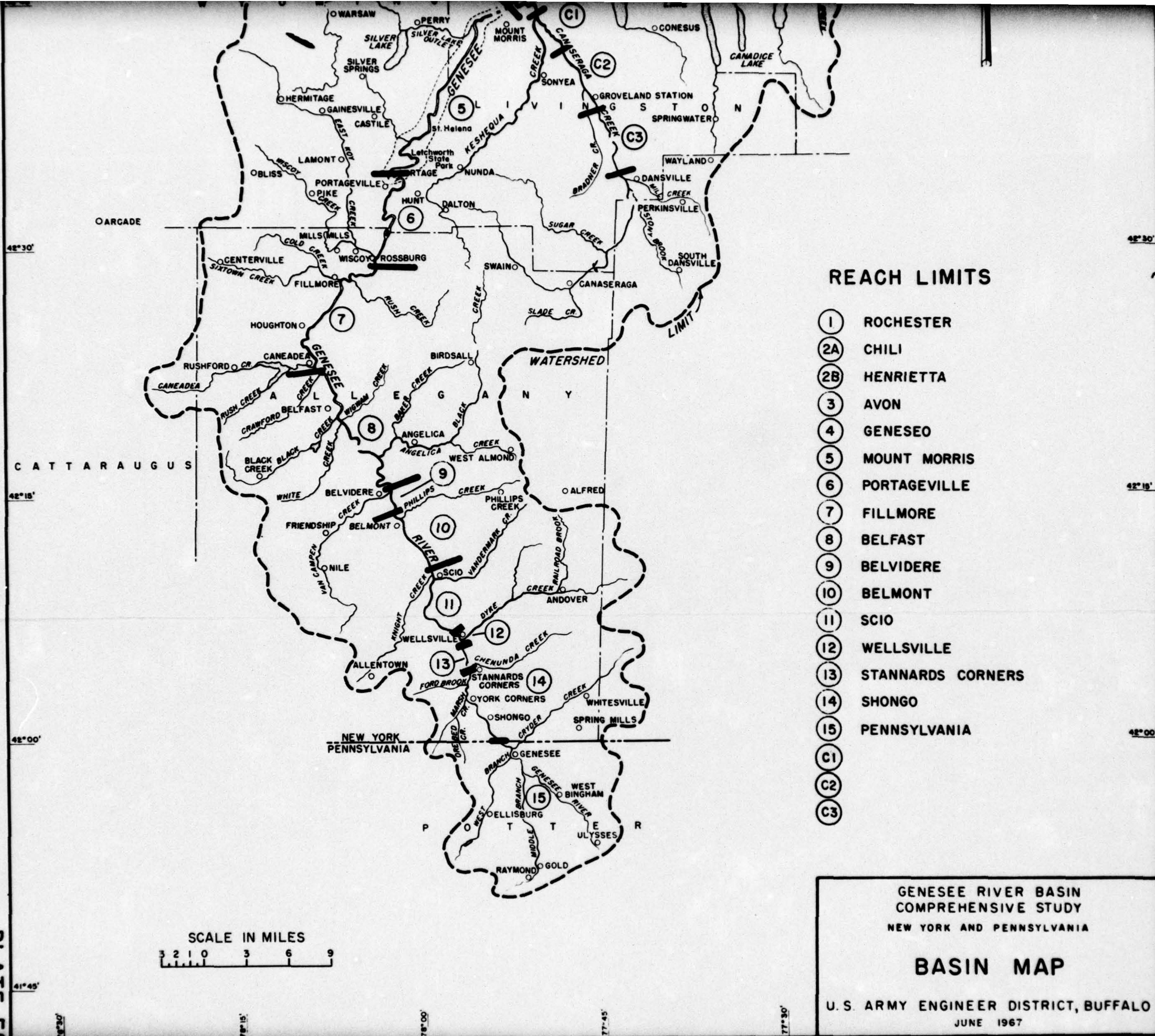
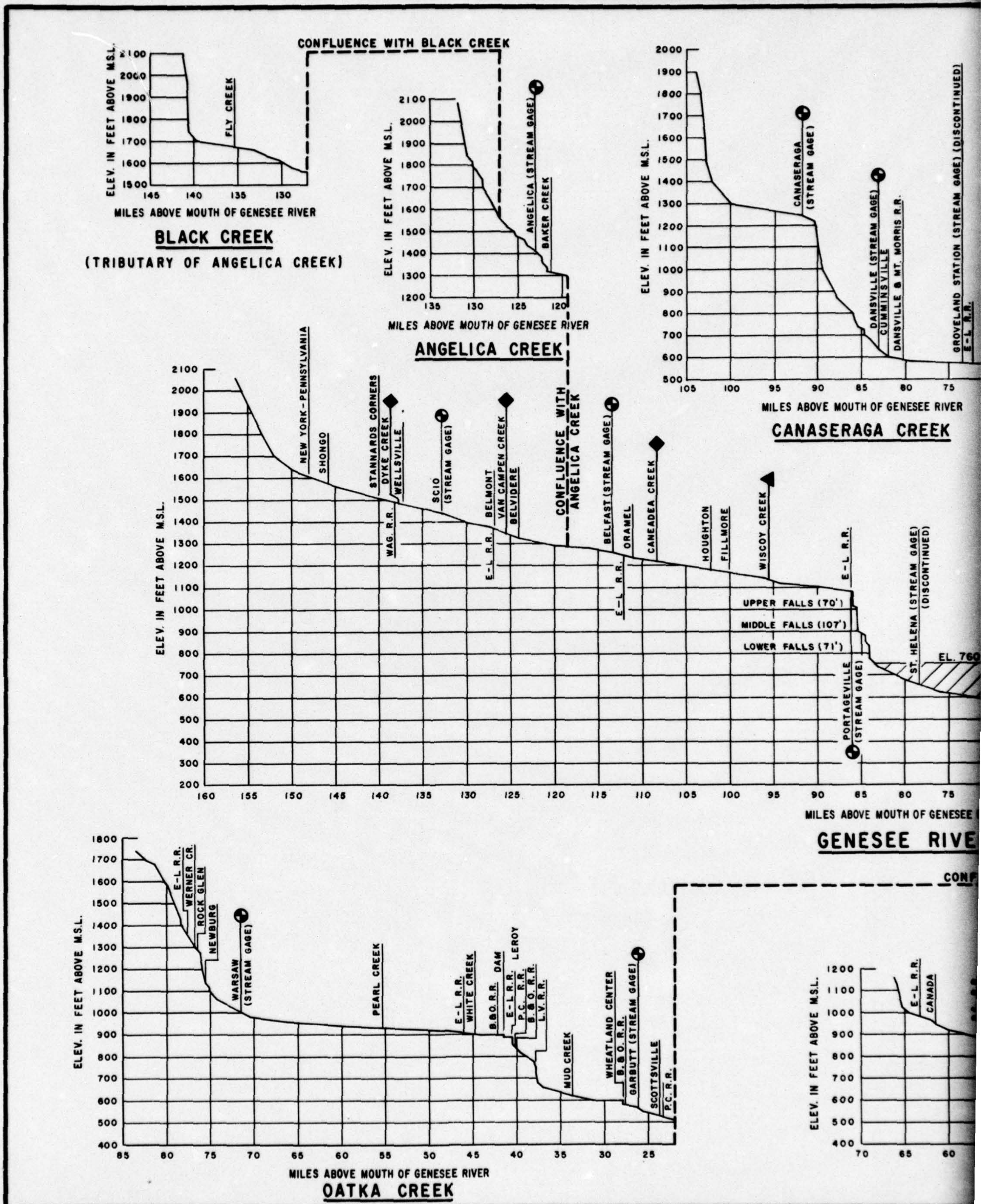
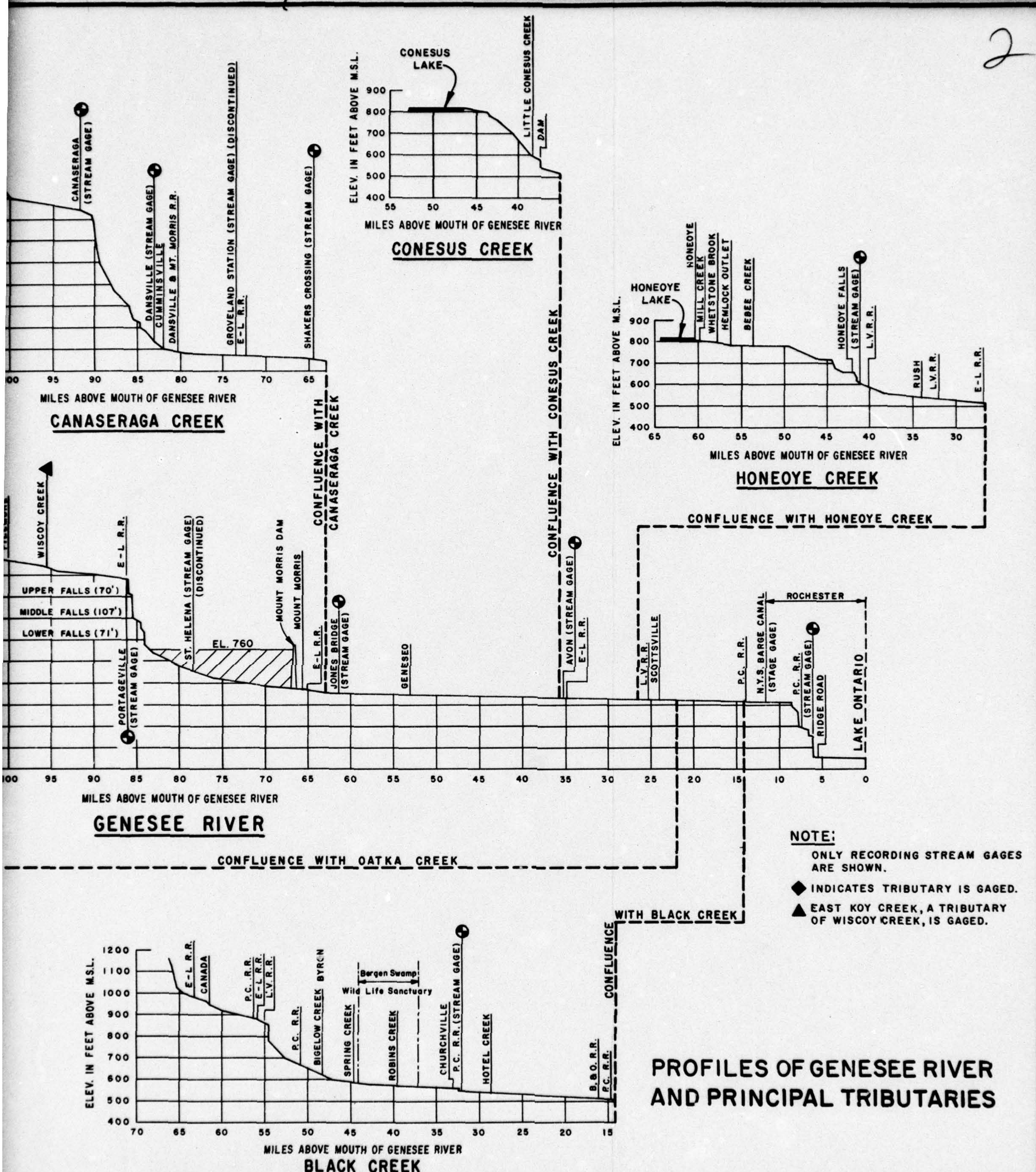

REACH LIMITS
1 ROCHESTER
2A CHILI
2B HENRIETTA
3 AVON
4 GENESEO
5 MOUNT MORRIS
6 PORTAGEVILLE
7 FILLMORE
8 BELFAST
9 BELVIDERE
10 BELMONT
11 SCIO
12 WELLSVILLE
13 STANNARDS CORNERS
14 SHONGO
15 PENNSYLVANIA
C1
C2
C3
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
BASIN MAP
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967
SCALE IN MILES
3 2 1 0 3 6 9
WATERSHED
LIMIT
CATTARAUGUS
ALLEGANY
LIVINGSTON
POTTER
NEW YORK
PENNSYLVANIA
GENESEE
RIVER
CANASERAGA CREEK
KESHEQUA CREEK
WARSAW
PERRY
SILVER LAKE
SILVER SPRINGS
HERMITAGE
GAINESVILLE
CASTILE
LAMONT
BLISS
PORTAGEVILLE
PIKE
ARCADE
CENTERVILLE
FILLMORE
HOUGHTON
RUSHFORD
CANEADEA
BELFAST
ANGELICA
BELVIDERE
BELMONT
FRIENDSHIP
NILE
SCIO
WELLSVILLE
ALLENTOWN
ANDOVER
ALFRED
STANNARDS CORNERS
YORK CORNERS
SHONGO
WHITESVILLE
SPRING MILLS
GENESEE
WEST BINGHAM
ELLISBURG
ULYSSES
RAYMOND
GOLD
MOUNT MORRIS
SONYEA
GROVELAND STATION
SPRINGWATER
CONESUS
CANADICE LAKE
WAYLAND
DANSVILLE
PERKINSVILLE
SOUTH DANSVILLE
NUNDA
DALTON
HUNT
SWAIN
CANASERAGA
BIRDSALL
WEST ALMOND
PHILLIPS CREEK
ROSSBURG
WISCOY
Letchworth State Park
St. Helena
42°30'
42°15'
42°00'
41°45'
78°30'
78°15'
78°00'
77°45'
77°30'

PLATE E2

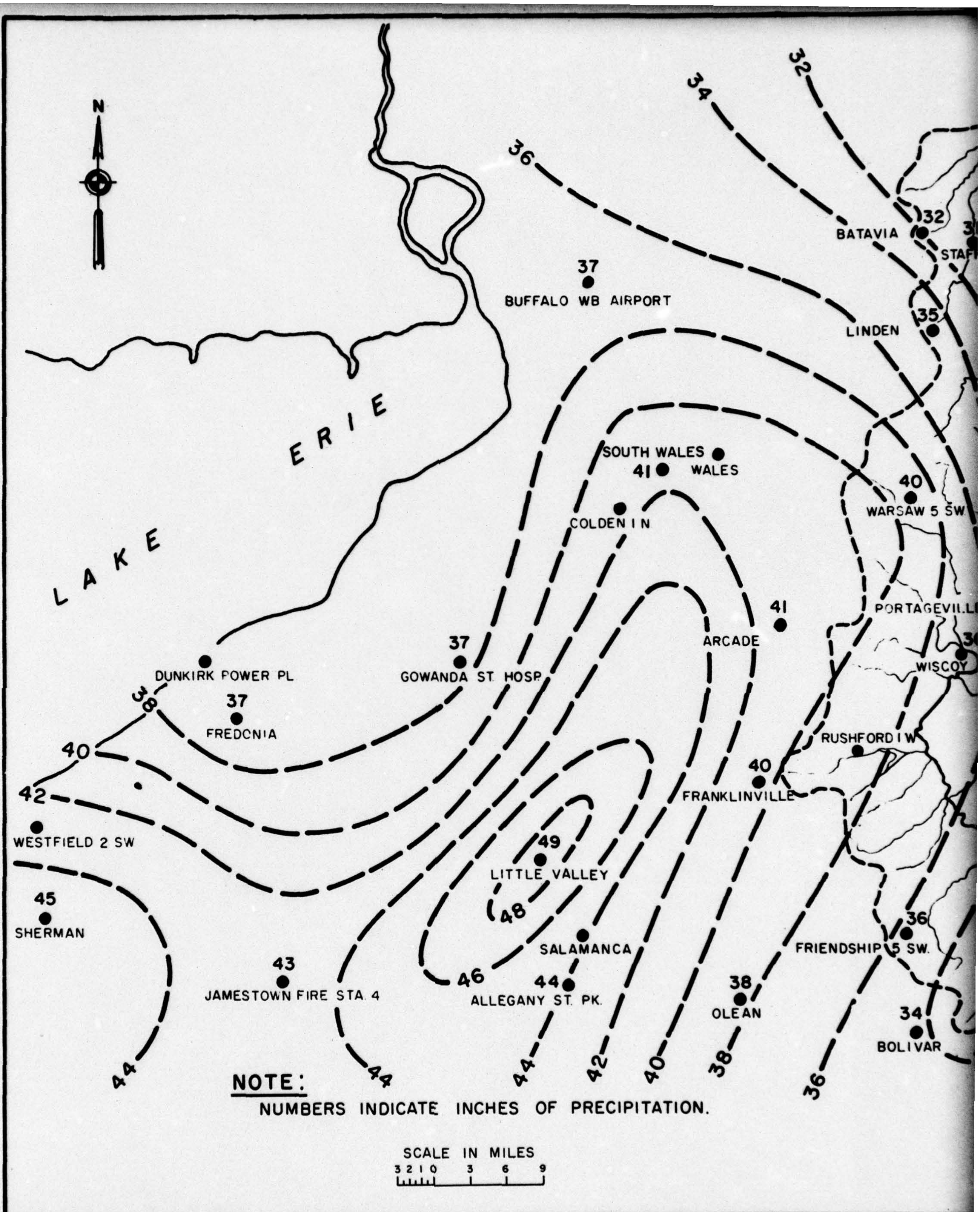


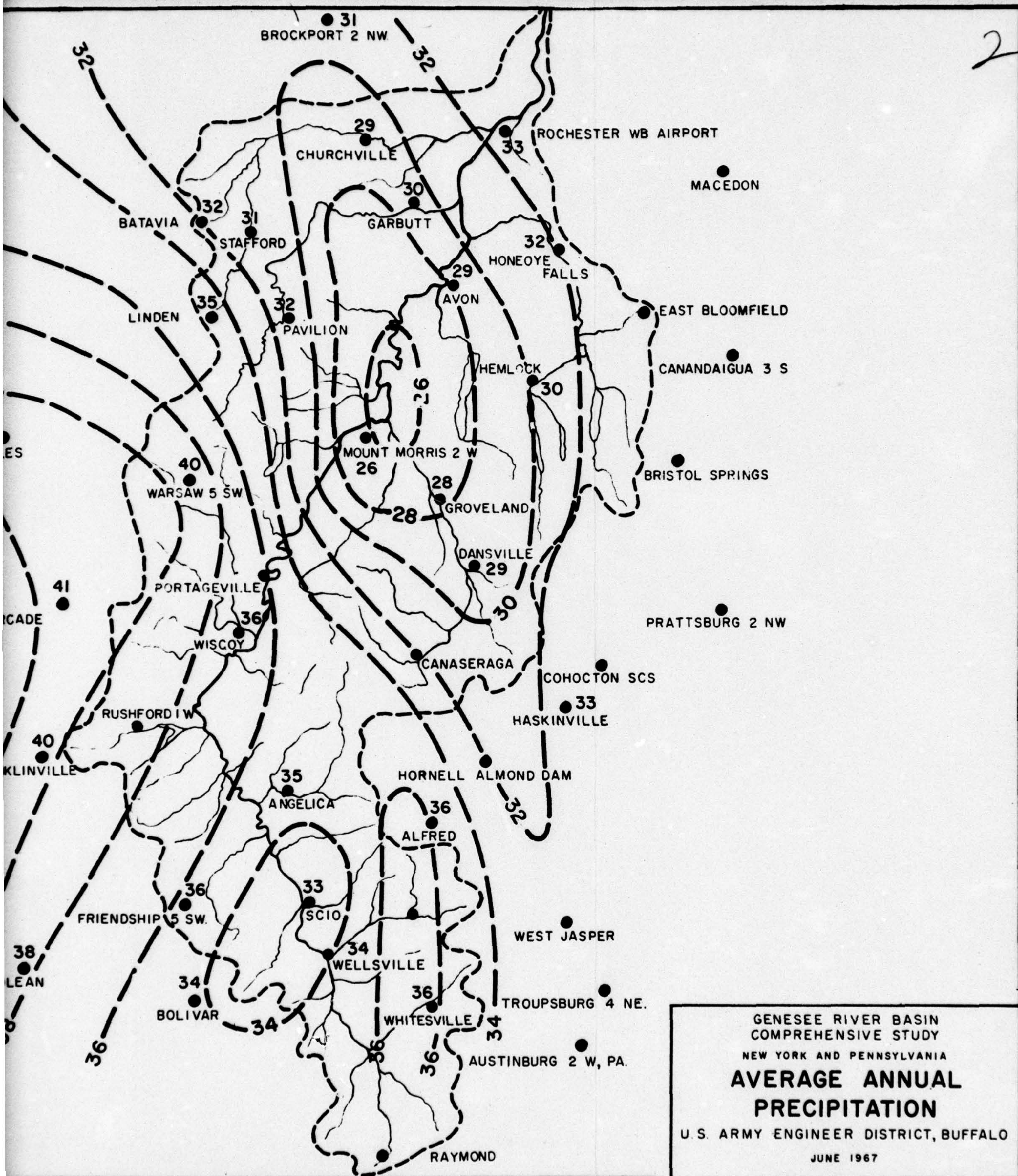
BLACK CREEK
(TRIBUTARY OF ANGELICA CREEK)
FLY CREEK
ELEV. IN FEET ABOVE M.S.L.
MILES ABOVE MOUTH OF GENESEE RIVER
CONFLUENCE WITH BLACK CREEK
ANGELICA CREEK
ANGELICA (STREAM GAGE)
BAKER CREEK
CANASERAGA CREEK
CANASERAGA (STREAM GAGE)
DANSVILLE (STREAM GAGE)
CUMMINSVILLE
DANSVILLE & MT. MORRIS R.R.
GROVELAND STATION (STREAM GAGE) (DISCONTINUED)
E-L R.R.
GENESEE RIVER
NEW YORK-PENNSYLVANIA
SHONGO
STANNARDS CORNERS
DYKE CREEK
WELLSVILLE
WAG. R.R.
SCIO (STREAM GAGE)
BELMONT
VAN CAMPEN CREEK
BELVIDERE
E-L R.R.
CONFLUENCE WITH ANGELICA CREEK
BELFAST (STREAM GAGE)
ORAMEL
E-L R.R.
CANEADEA CREEK
HOUGHTON
FILLMORE
WISCOY CREEK
E-L R.R.
UPPER FALLS (70')
MIDDLE FALLS (107')
LOWER FALLS (71')
PORTAGEVILLE (STREAM GAGE)
ST. HELENA (STREAM GAGE) (DISCONTINUED)
EL. 760
OATKA CREEK
E-L R.R.
WERNER CR.
ROCK GLEN
NEWBURG
WARSAW (STREAM GAGE)
PEARL CREEK
E-L R.R.
WHITE CREEK
B.&O. R.R.
DAM
E-L R.R.
P.C. R.R.
B.&O. R.R.
L.V. R.R.
LEROY
MUD CREEK
WHEATLAND CENTER
B.&O. R.R.
GARBUTT (STREAM GAGE)
SCOTTSVILLE
P.C. R.R.
CONF
E-L R.R.
CANADA



PROFILES OF GENESEE RIVER AND PRINCIPAL TRIBUTARIES

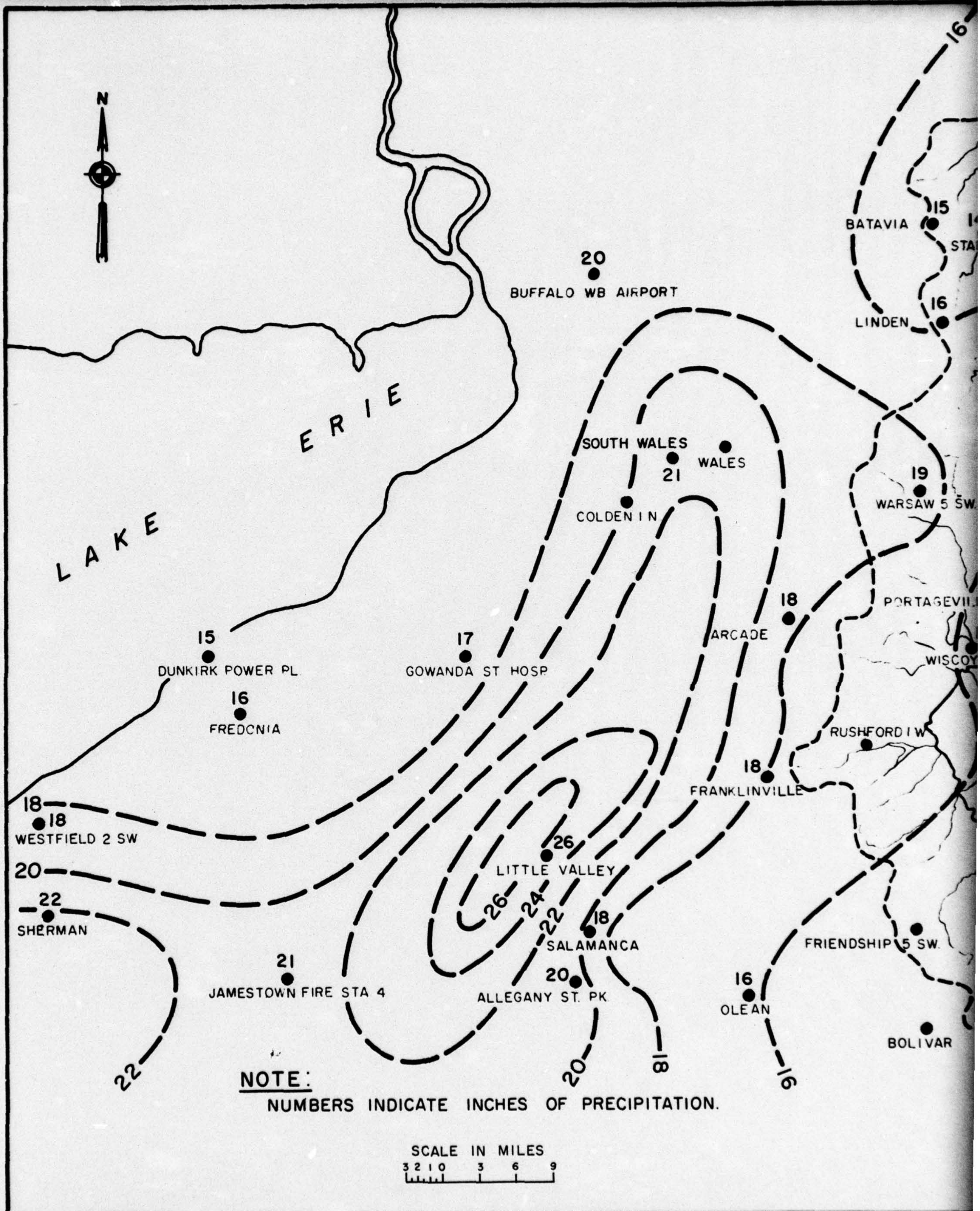
PLATE E3


N
LAKE ERIE
37
BUFFALO WB AIRPORT
BATAVIA
32
LINDEN
35
SOUTH WALES
41
WALES
COLDEN I N
40
WARSAW 5 SW.
41
ARCADE
PORTAGEVILLE
WISCOY
37
DUNKIRK POWER PL
37
GOWANDA ST. HOSP.
37
FREDONIA
40
FRANKLINVILLE
RUSHFORD I W
WESTFIELD 2 SW
49
LITTLE VALLEY
45
SHERMAN
SALAMANCA
36
FRIENDSHIP 5 SW.
43
JAMESTOWN FIRE STA. 4
44
ALLEGANY ST. PK.
38
OLEAN
34
BOLIVAR
32
34
36
38
40
42
44
46
48
NOTE:
NUMBERS INDICATE INCHES OF PRECIPITATION.
SCALE IN MILES
3 2 1 0 3 6 9



2
BROCKPORT 2 NW
ROCHESTER WB AIRPORT
CHURCHVILLE
MACEDON
BATAVIA
STAFFORD
GARBUTT
HONEOYE FALLS
AVON
EAST BLOOMFIELD
LINDEN
PAVILION
HEMLOCK
CANANDAIGUA 3 S
MOUNT MORRIS 2 W
BRISTOL SPRINGS
WARSAW 5 SW
GROVELAND
DANSVILLE
PORTAGEVILLE
PRATTSBURG 2 NW
WISCOY
CANASERAGA
COHOCTON SCS
HASKINVILLE
RUSHFORD I W
HORNELL ALMOND DAM
ANGELICA
ALFRED
FRIENDSHIP 5 SW.
SCIO
WEST JASPER
WELLSVILLE
BOLIVAR
TROUPSBURG 4 NE.
WHITESVILLE
AUSTINBURG 2 W, PA.
RAYMOND
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
AVERAGE ANNUAL
PRECIPITATION
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

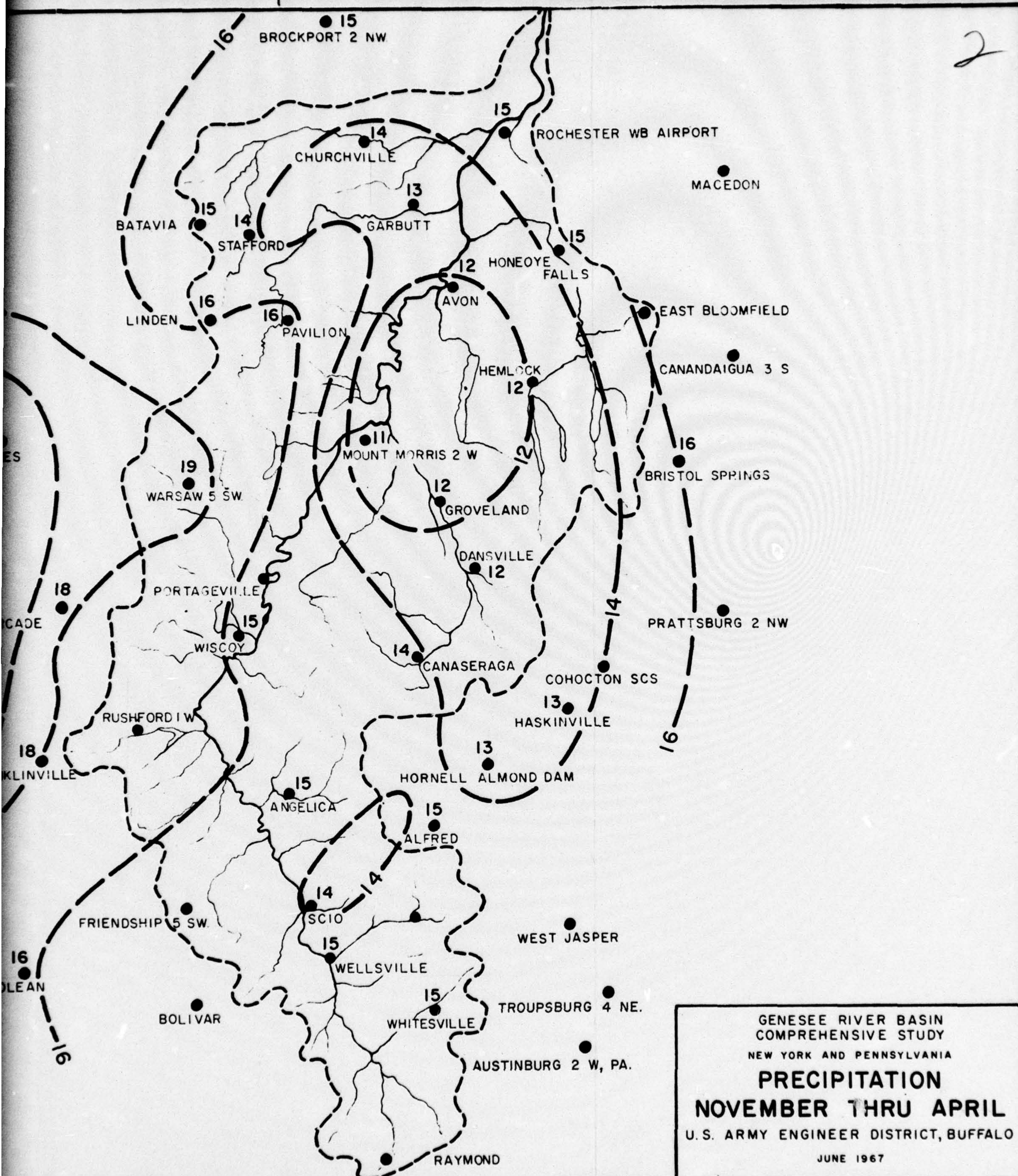
PLATE E4



NOTE:
NUMBERS INDICATE INCHES OF PRECIPITATION.

SCALE IN MILES
3 2 1 0 3 6 9

2

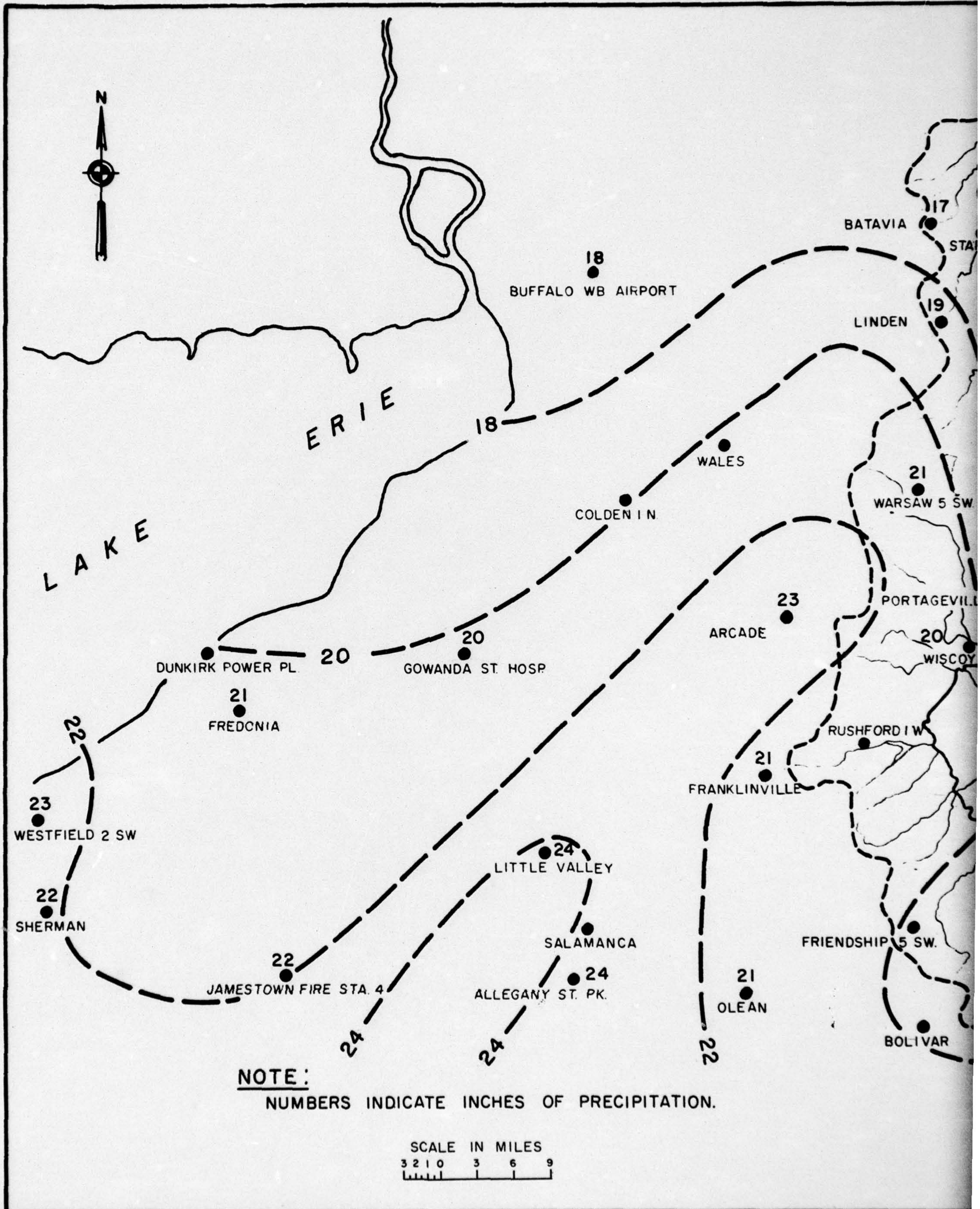


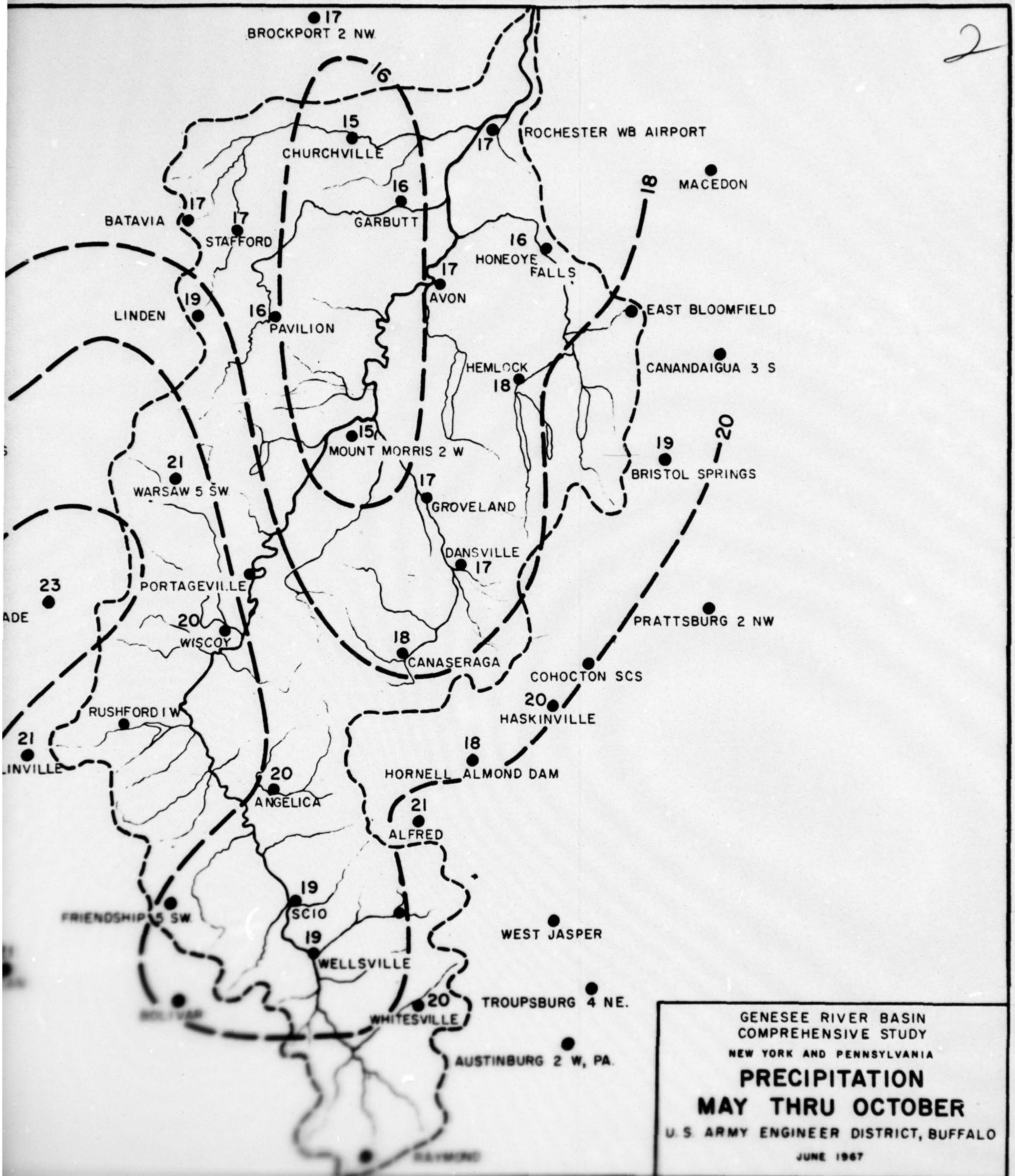
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

PRECIPITATION
NOVEMBER THRU APRIL

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE E5


N
LAKE ERIE
18
BUFFALO WB AIRPORT
17
BATAVIA
19
LINDEN
18
WALES
21
WARSAW 5 SW.
COLDEN I N.
23
ARCADE
PORTAGEVILL
20
WISCOY
20
GOWANDA ST. HOSP.
20
DUNKIRK POWER PL.
21
FREDONIA
22
RUSHFORD I W.
21
FRANKLINVILLE
23
WESTFIELD 2 SW
24
LITTLE VALLEY
22
SHERMAN
SALAMANCA
FRIENDSHIP 5 SW.
22
JAMESTOWN FIRE STA. 4
24
ALLEGANY ST. PK.
21
OLEAN
BOLIVAR
24
24
22
NOTE:
NUMBERS INDICATE INCHES OF PRECIPITATION.
SCALE IN MILES
3 2 1 0 3 6 9



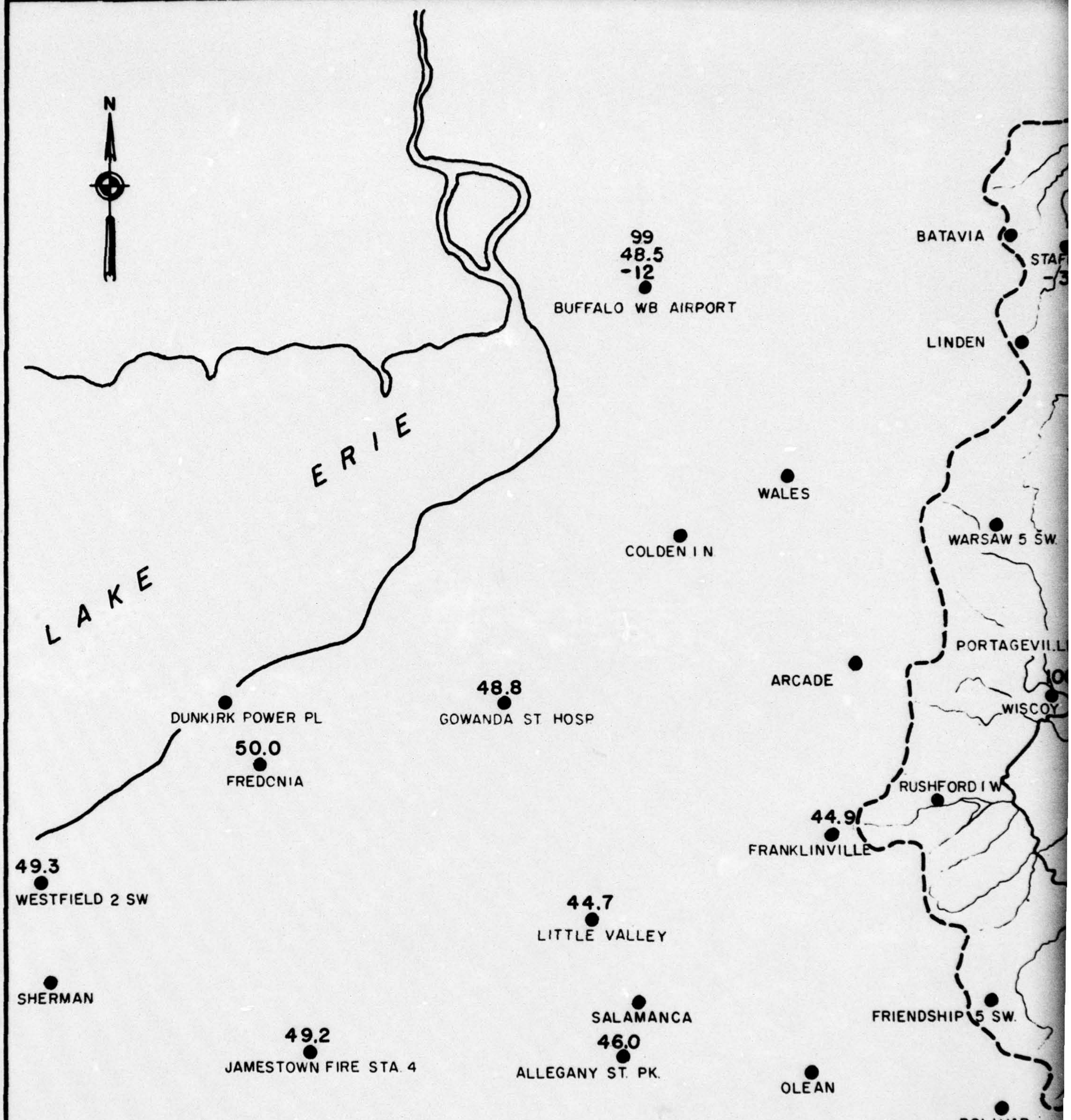
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

PRECIPITATION
MAY THRU OCTOBER

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

PLATE E 6



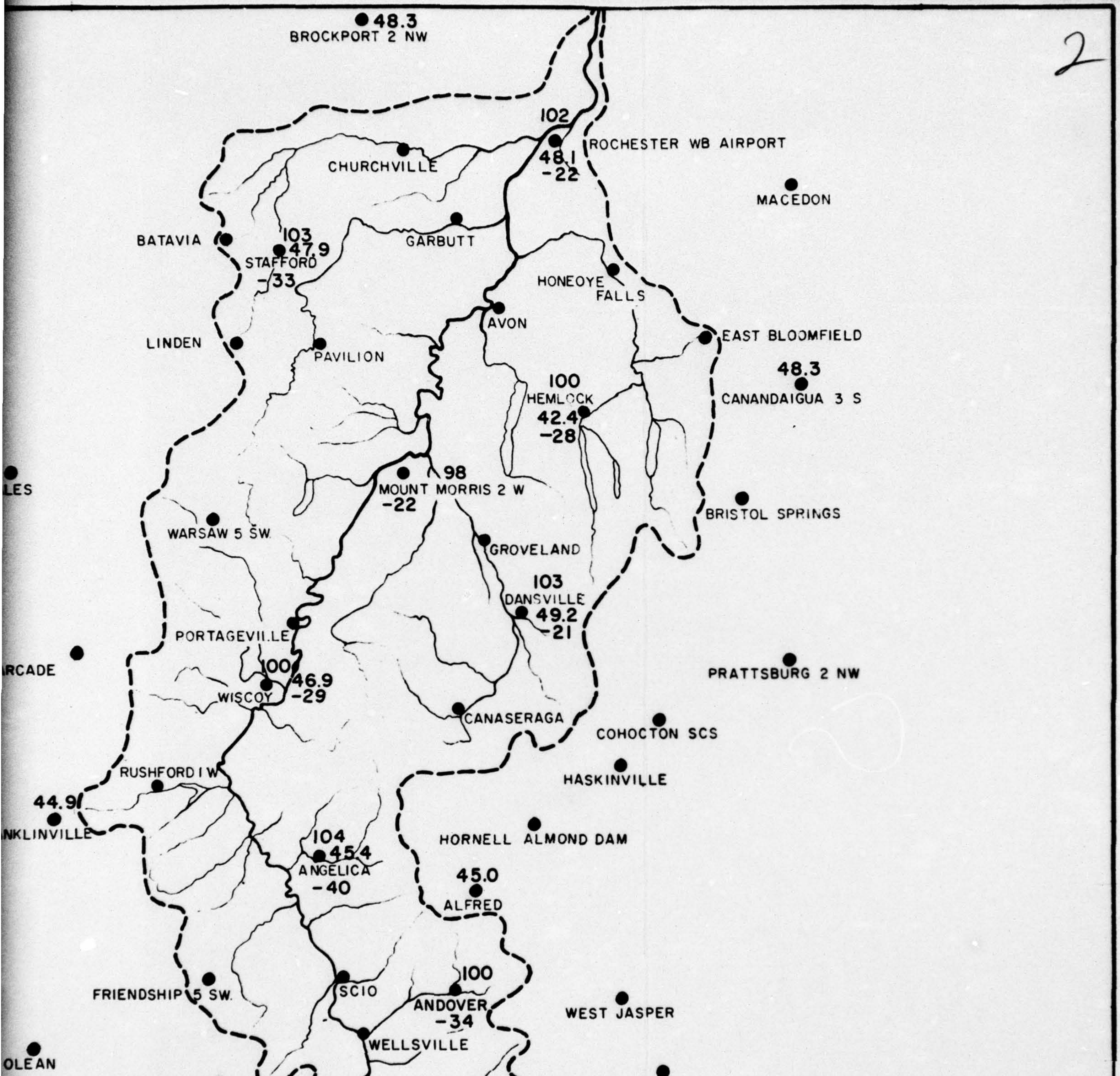
NOTE:

NUMBERS INDICATE HIGHEST, MEAN AND LOWEST TEMPERATURES OF RECORD IN DEGREES FAHRENHEIT. WHERE ONE NUMBER IS SHOWN, IT IS THE MEAN TEMPERATURE FOR THE STATION.

SCALE IN MILES

3 2 1 0 3 6 9

2

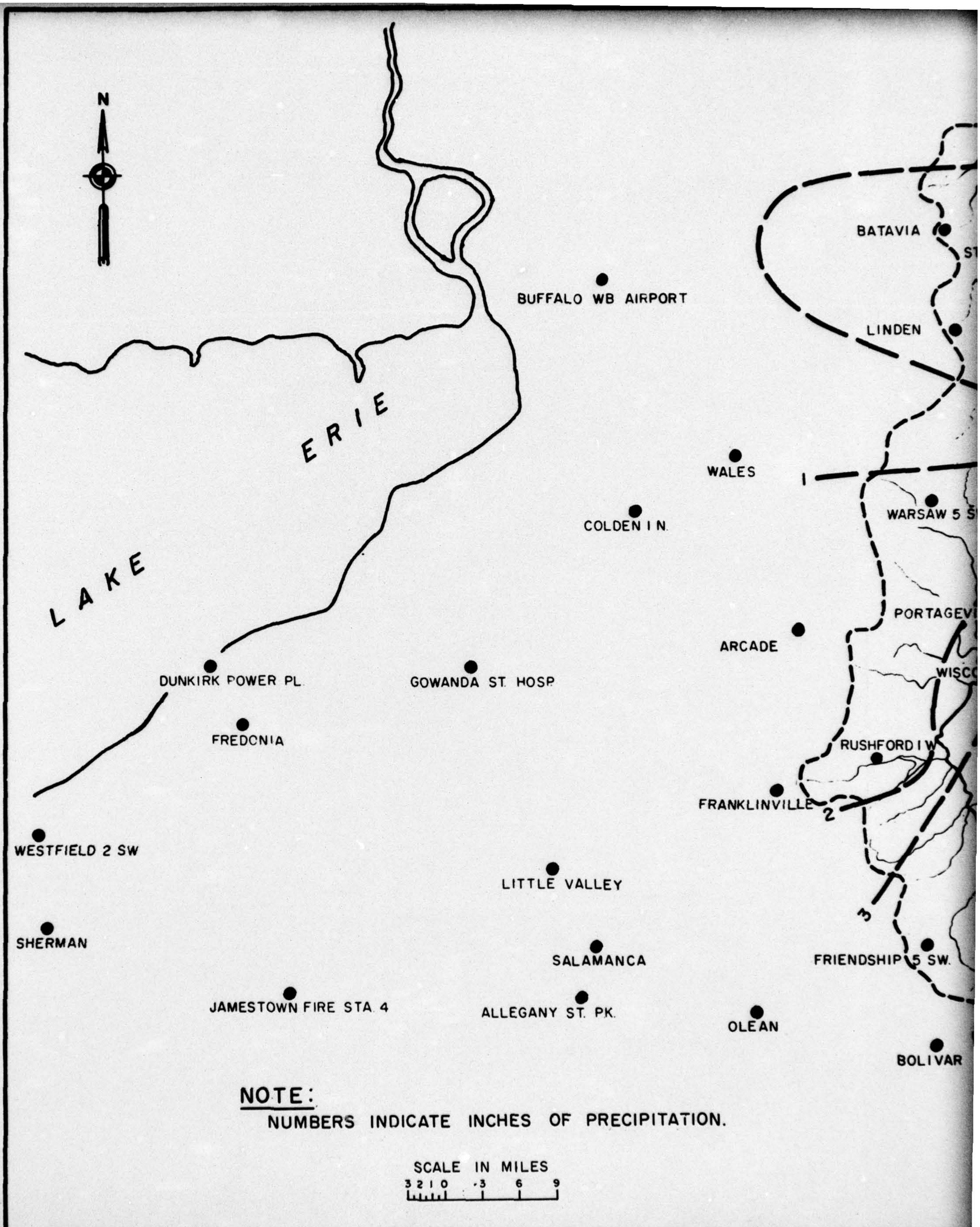


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

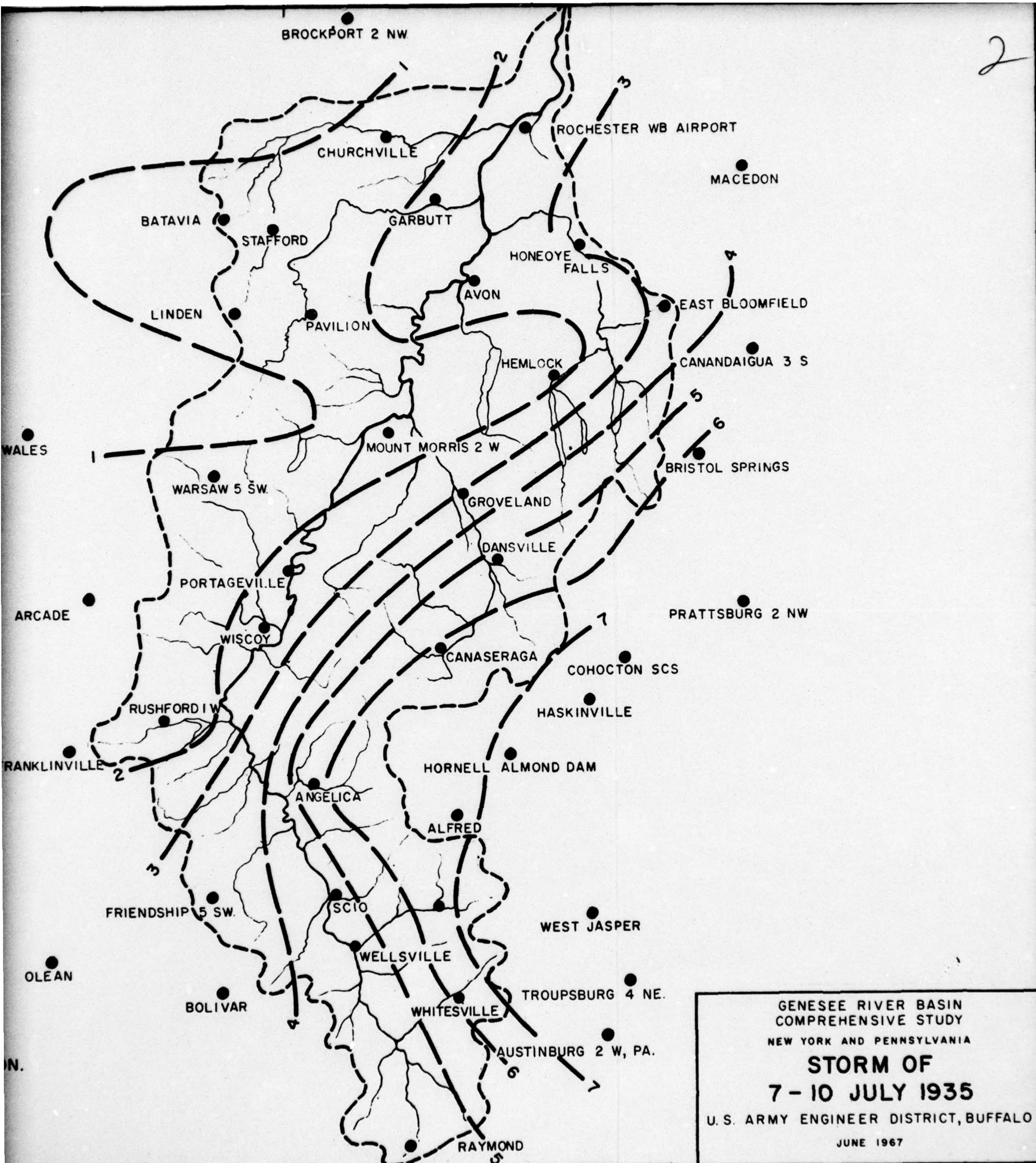
TEMPERATURES

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE E7


N
LAKE ERIE
BUFFALO WB AIRPORT
BATAVIA
LINDEN
WALES
COLDEN 1 N.
ARCADE
DUNKIRK POWER PL.
GOWANDA ST. HOSP.
FREDONIA
RUSHFORD 1 W
FRANKLINVILLE
WESTFIELD 2 SW
LITTLE VALLEY
SHERMAN
SALAMANCA
FRIENDSHIP 5 SW.
JAMESTOWN FIRE STA. 4
ALLEGANY ST. PK.
OLEAN
BOLIVAR
1
2
3
NOTE:
NUMBERS INDICATE INCHES OF PRECIPITATION.
SCALE IN MILES
3 2 1 0 3 6 9

2

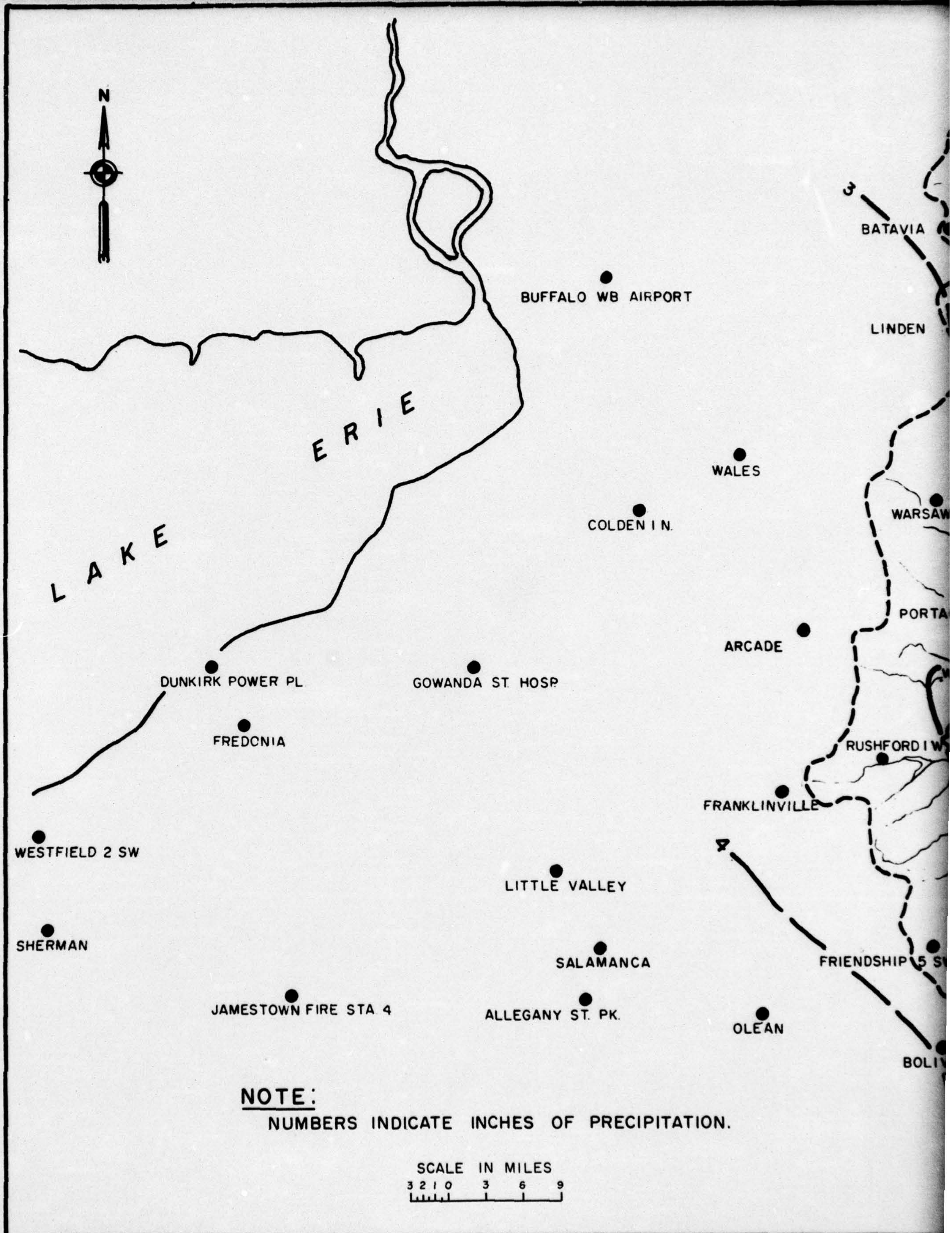


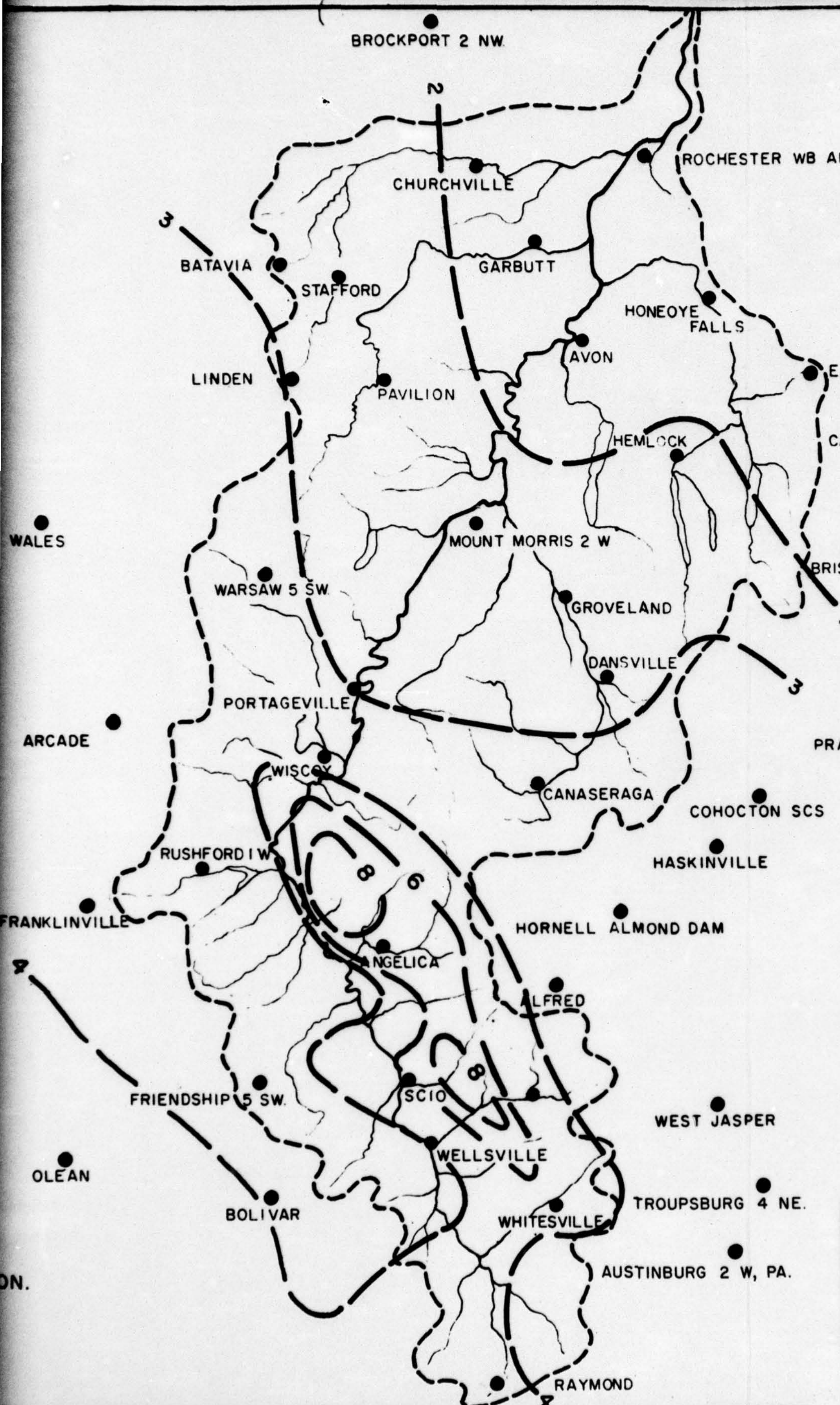
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STORM OF
7 - 10 JULY 1935

U. S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE E8


N
LAKE ERIE
BUFFALO WB AIRPORT
BATAVIA
LINDEN
WALES
COLDEN I N.
WARSAW
PORTA
ARCADE
DUNKIRK POWER PL
GOWANDA ST. HOSP.
FREDONIA
RUSHFORD I W
FRANKLINVILLE
WESTFIELD 2 SW
LITTLE VALLEY
SHERMAN
SALAMANCA
FRIENDSHIP 5 S
JAMESTOWN FIRE STA 4
ALLEGANY ST. PK.
OLEAN
BOLI
3
4
NOTE:
NUMBERS INDICATE INCHES OF PRECIPITATION.
SCALE IN MILES
3 2 1 0 3 6 9

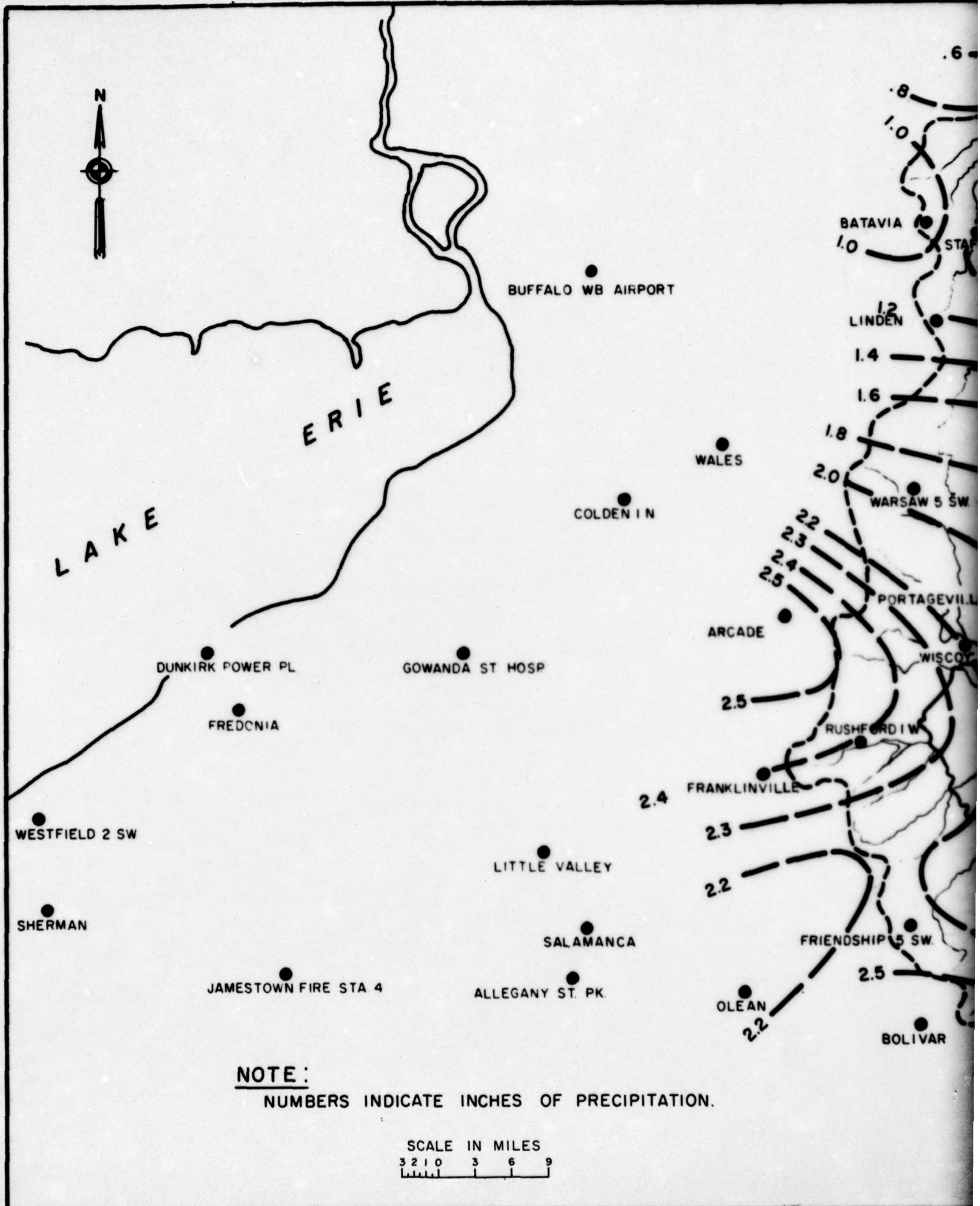


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

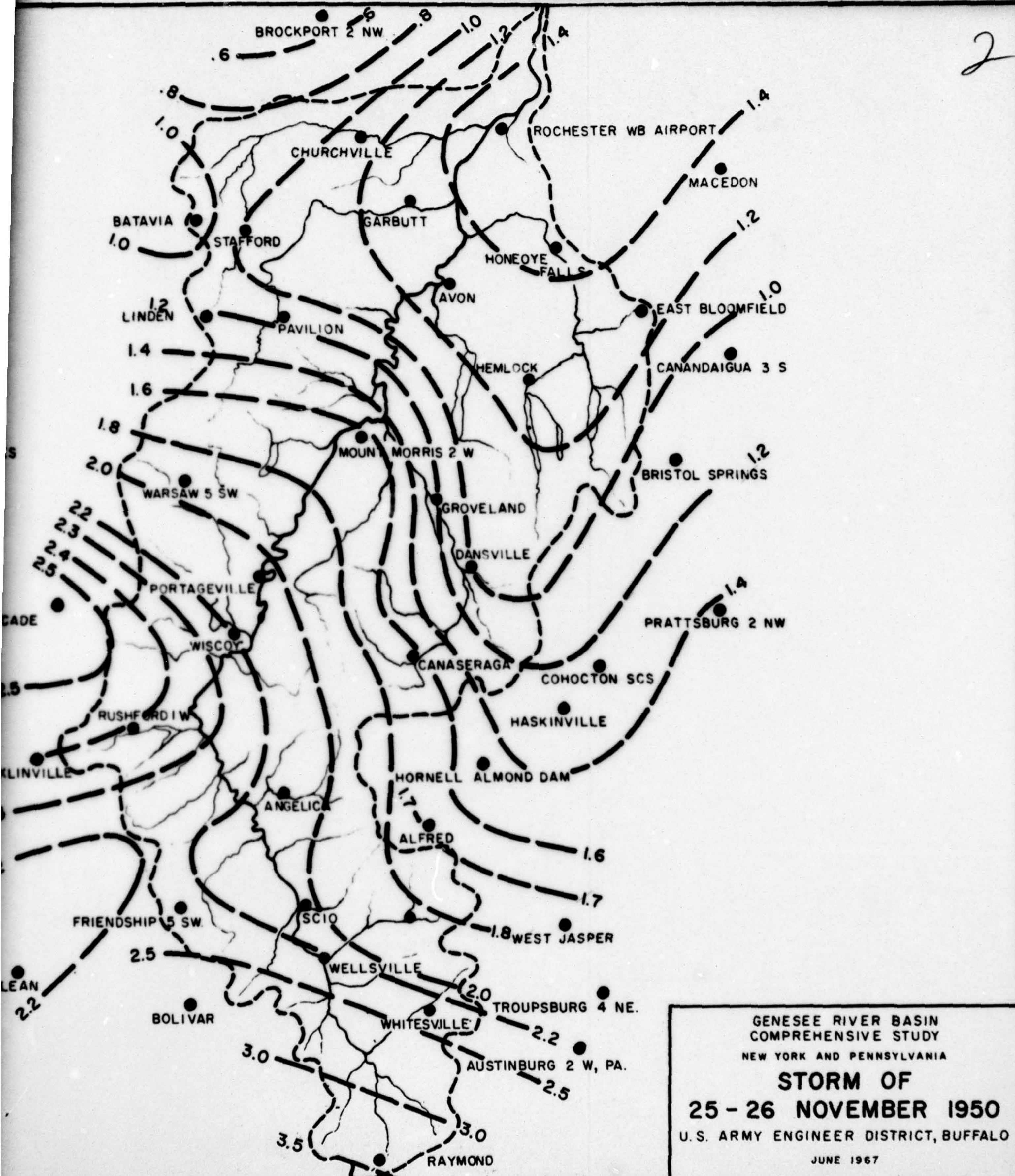
STORM OF
17-18 JULY 1942

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE E 9



N
LAKE ERIE
BUFFALO WB AIRPORT
BATAVIA
LINDEN
WALES
COLDEN I N
WARSAW 5 SW.
ARCADE
PORTAGEVILL
WISCOY
DUNKIRK POWER PL
GOWANDA ST HOSP
FREDONIA
RUSHFORD I W
FRANKLINVILLE
WESTFIELD 2 SW
LITTLE VALLEY
SHERMAN
SALAMANCA
FRIENDSHIP 5 SW.
JAMESTOWN FIRE STA 4
ALLEGANY ST. PK.
OLEAN
BOLIVAR
.6
.8
1.0
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.3
2.4
2.5
2.5
2.4
2.3
2.2
2.5
2.2
NOTE:
NUMBERS INDICATE INCHES OF PRECIPITATION.
SCALE IN MILES
3 2 1 0 3 6 9



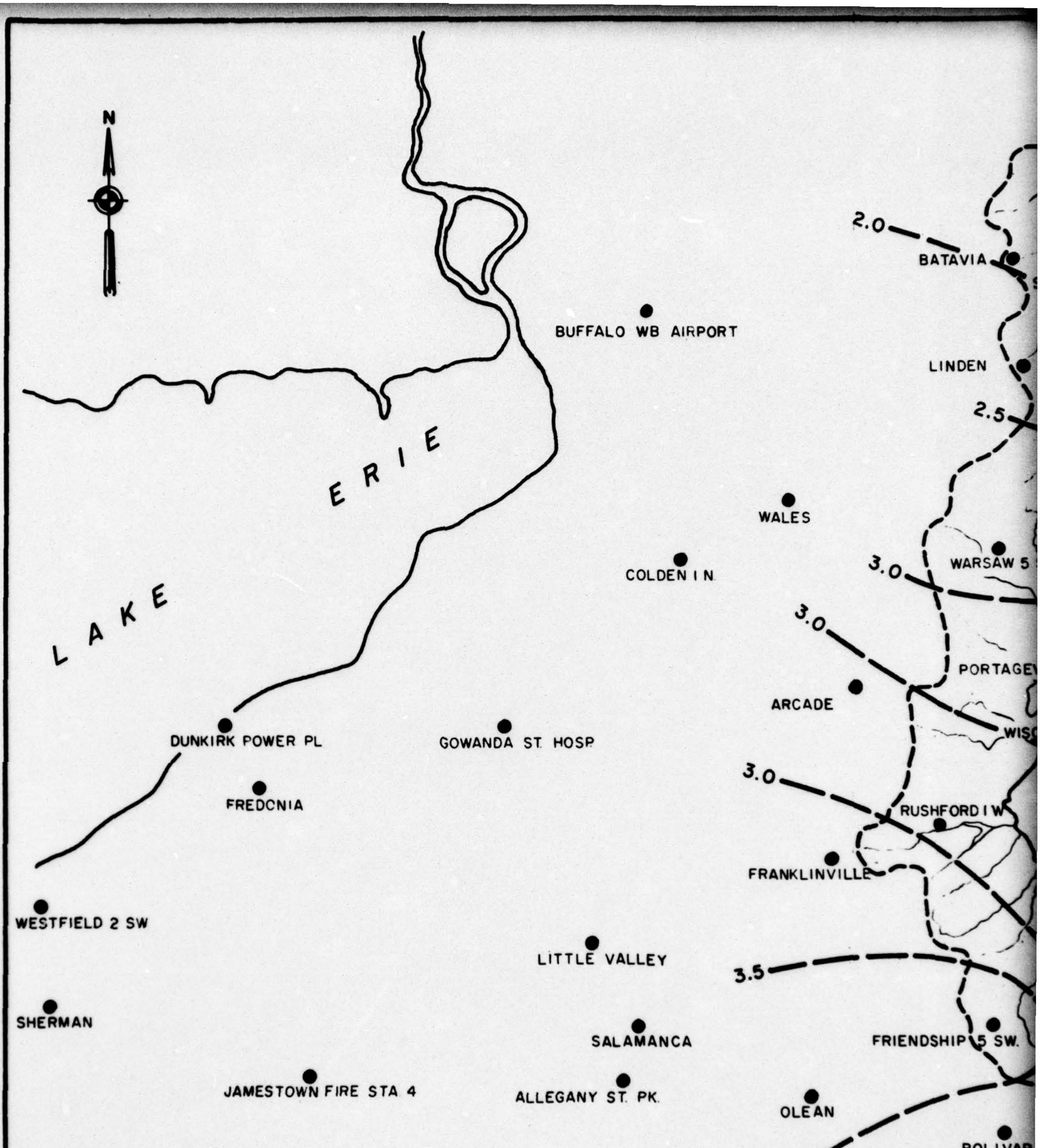
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STORM OF 25 - 26 NOVEMBER 1950

U.S. ARMY ENGINEER DISTRICT, BUFFALO

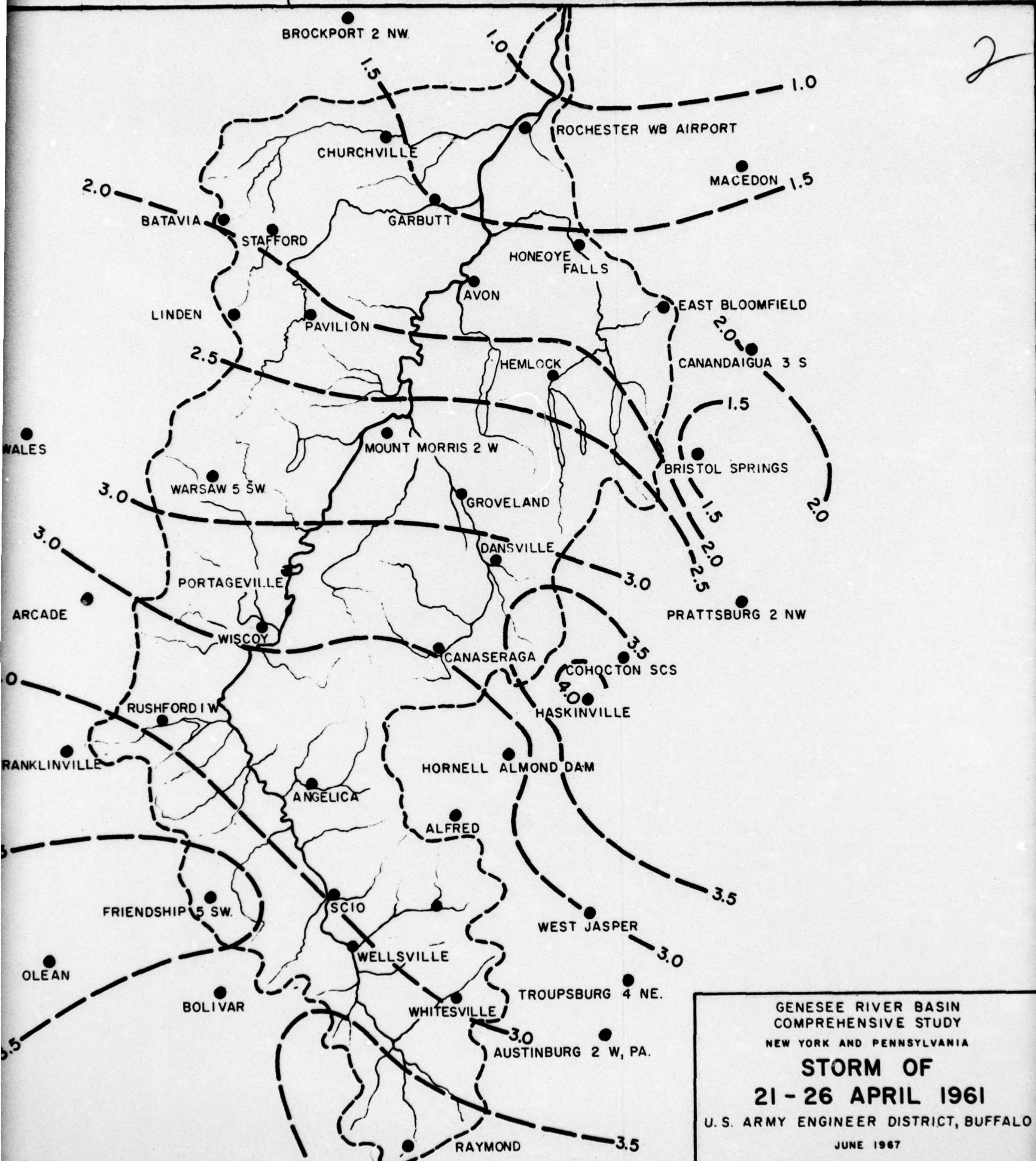
JUNE 1967

PLATE E10



NOTE:

NUMBERS INDICATE INCHES OF PRECIPITATION

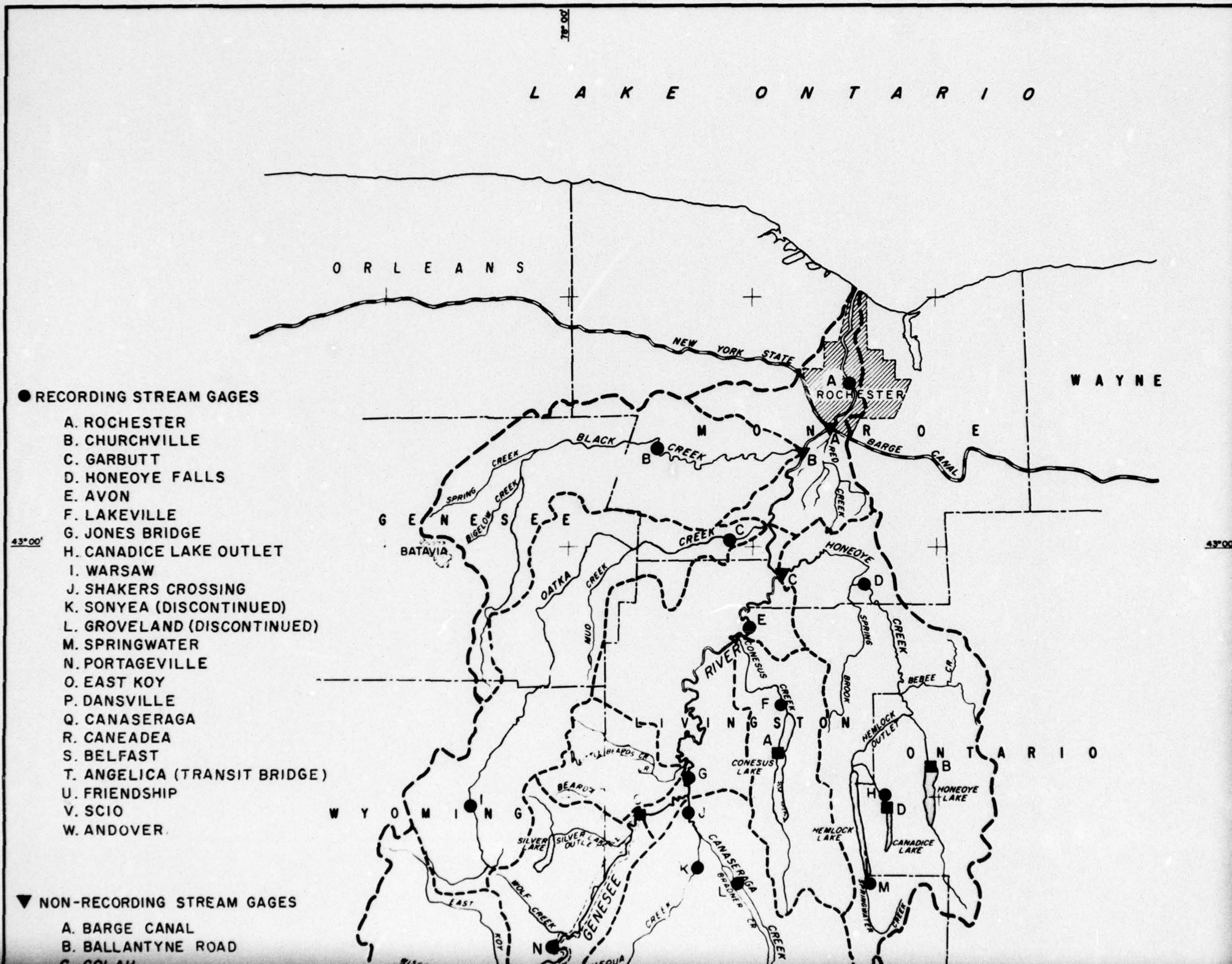


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STORM OF
21 - 26 APRIL 1961

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE E11


LAKE ONTARIO
ORLEANS
WAYNE
MONROE
GENESEE
LIVINGSTON
ONTARIO
WYOMING
NEW YORK STATE
BARGE CANAL
ROCHESTER
BATAVIA
78°00'
43°00'
BLACK CREEK
SPRING CREEK
BIGELOW CREEK
OATKA CREEK
MUD CREEK
HONEOYE CREEK
SPRING BROOK
BEBEE CR
RED CREEK
CONESUS CREEK
CONESUS LAKE
HEMLOCK OUTLET
HEMLOCK LAKE
HONEOYE LAKE
CANADICE LAKE
SPRINGWATER CREEK
CANASERAGA CREEK
BRADNER CR
SILVER LAKE
SILVER LAKE OUTLET
WOLF CREEK
EAST KOY
GENESEE RIVER
● RECORDING STREAM GAGES
A. ROCHESTER
B. CHURCHVILLE
C. GARBUTT
D. HONEOYE FALLS
E. AVON
F. LAKEVILLE
G. JONES BRIDGE
H. CANADICE LAKE OUTLET
I. WARSAW
J. SHAKERS CROSSING
K. SONYEA (DISCONTINUED)
L. GROVELAND (DISCONTINUED)
M. SPRINGWATER
N. PORTAGEVILLE
O. EAST KOY
P. DANSVILLE
Q. CANASERAGA
R. CANEADEA
S. BELFAST
T. ANGELICA (TRANSIT BRIDGE)
U. FRIENDSHIP
V. SCIO
W. ANDOVER
▼ NON-RECORDING STREAM GAGES
A. BARGE CANAL
B. BALLANTYNE ROAD
C. GOLAH

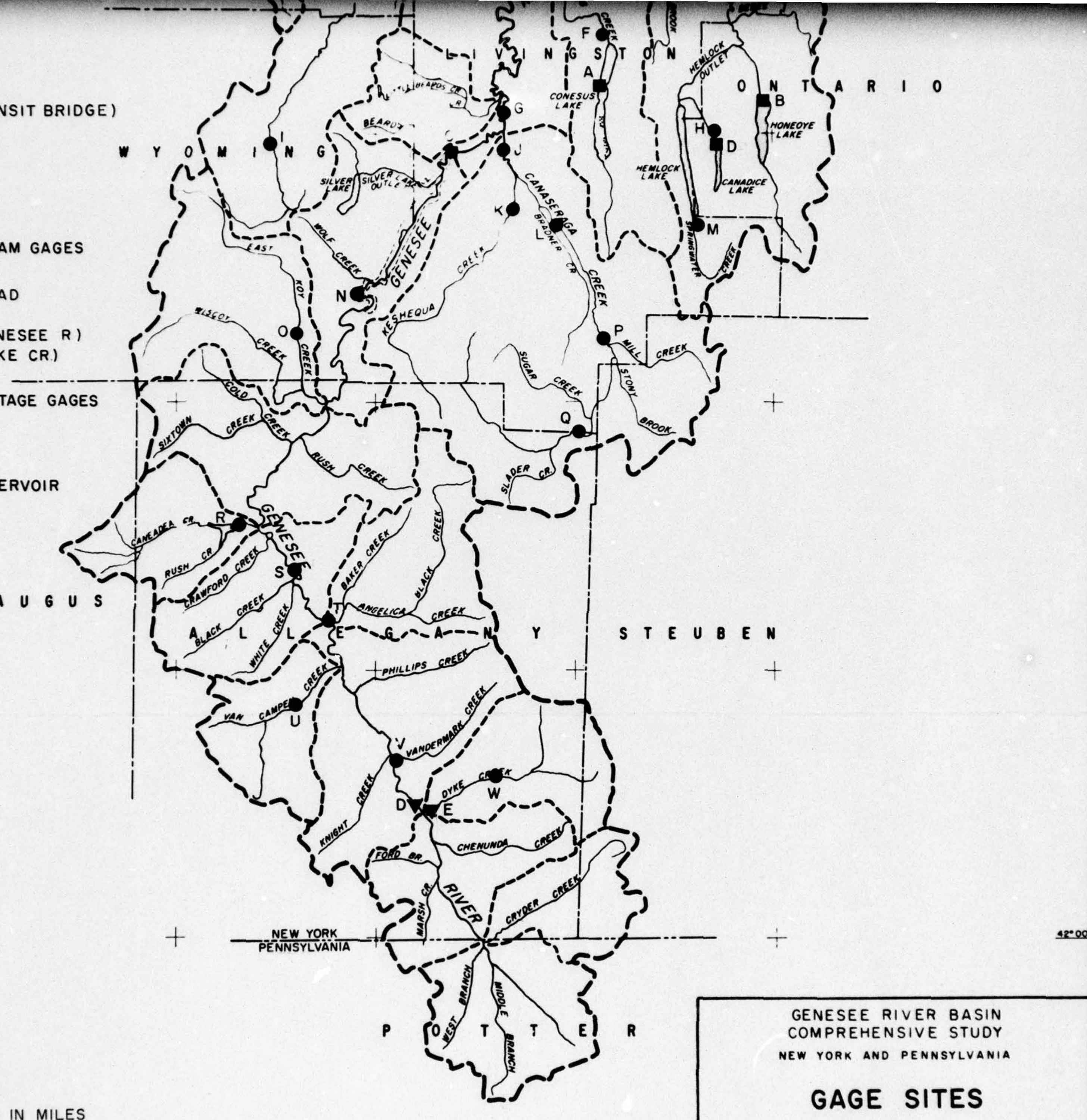
O. EAST KOY
P. DANSVILLE
Q. CANASERAGA
R. CANEADEA
S. BELFAST
T. ANGELICA (TRANSIT BRIDGE)
U. FRIENDSHIP
V. SCIO
W. ANDOVER

▼ NON-RECORDING STREAM GAGES

A. BARGE CANAL
B. BALLANTYNE ROAD
C. GOLAH
D. WELLSVILLE (GENESEE R)
E. WELLSVILLE (DYKE CR.)

■ LAKE AND RESERVOIR STAGE GAGES

A. CANADICE LAKE
B. HONEOYE LAKE
C. CONESUS LAKE
D. MT. MORRIS RESERVOIR

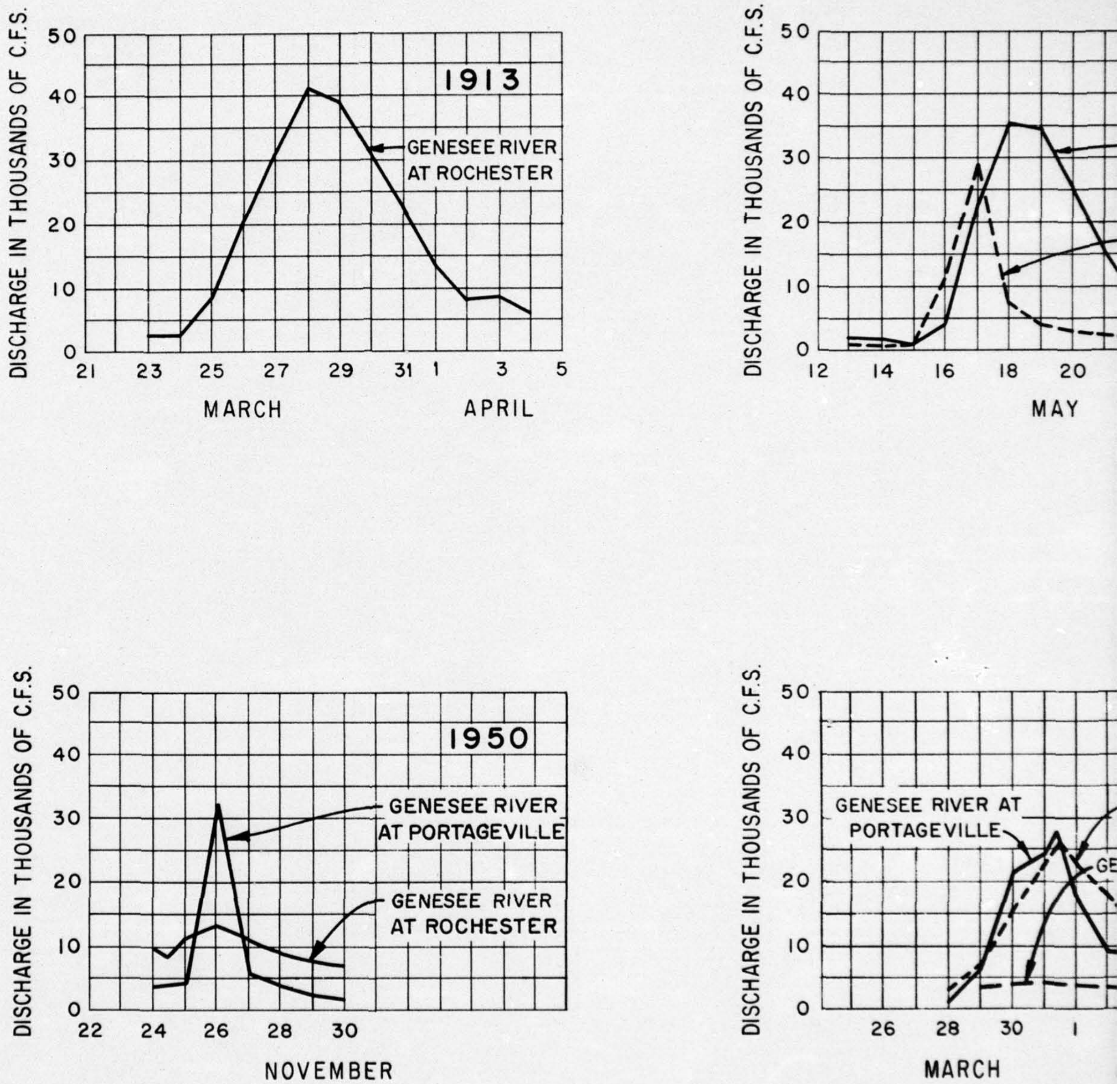


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

GAGE SITES

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE E12



* MODIFIED BY MOUNT MO

AD-A041 705 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 8/6
GENESEE RIVER BASIN COMPREHENSIVE STUDY OF WATER AND RELATED LA--ETC(U)
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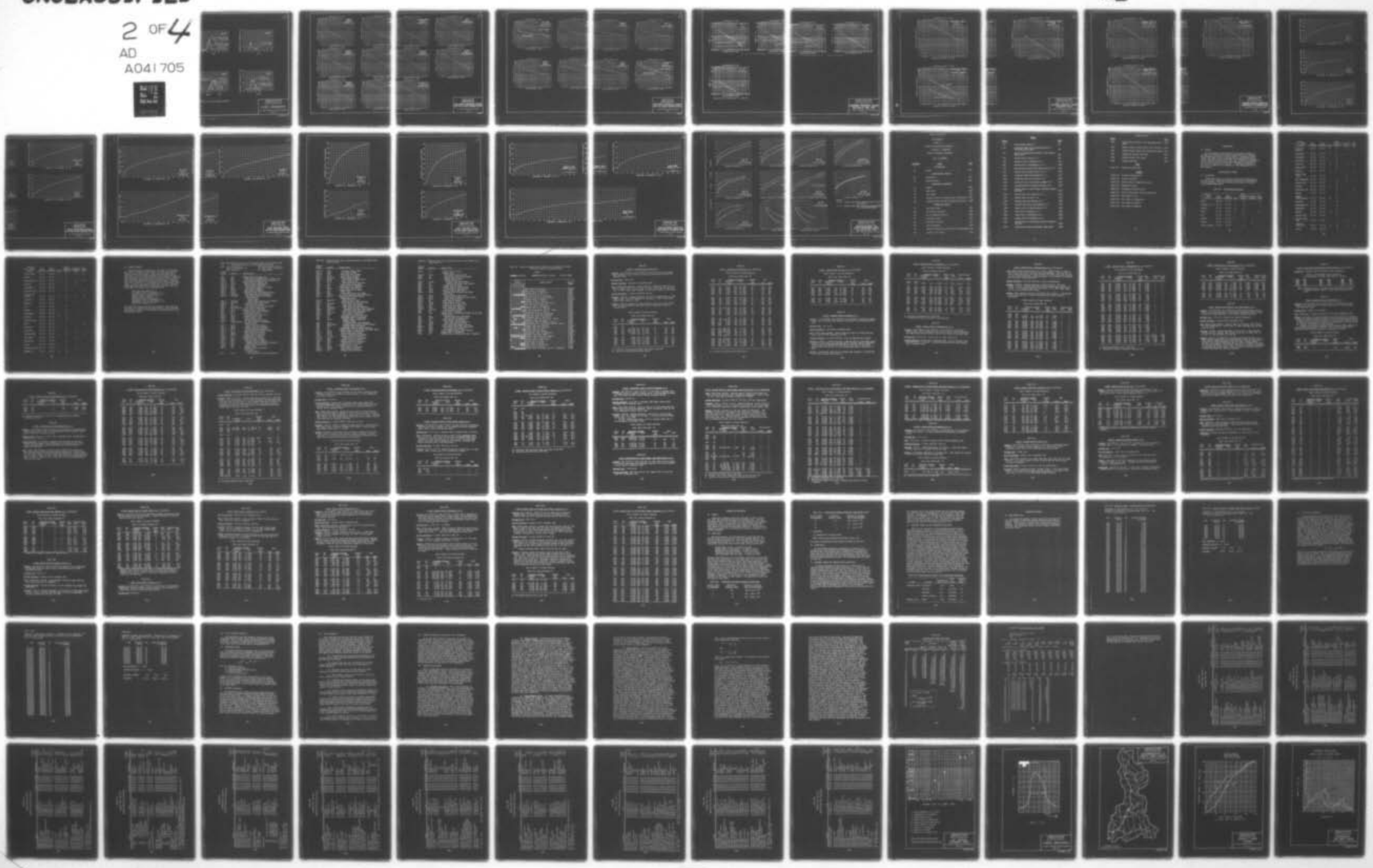
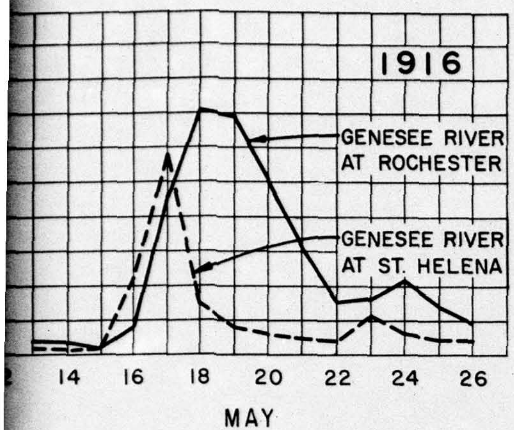
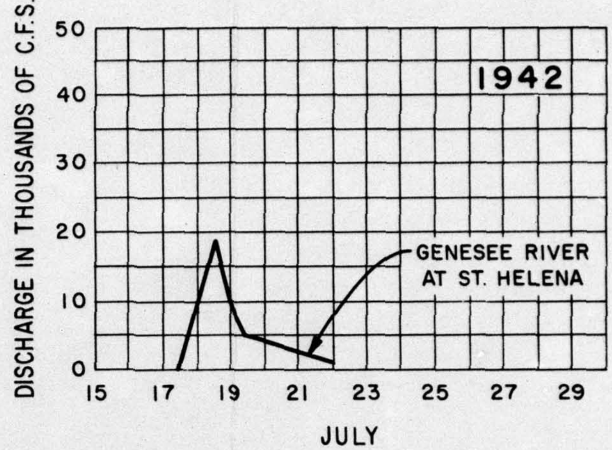


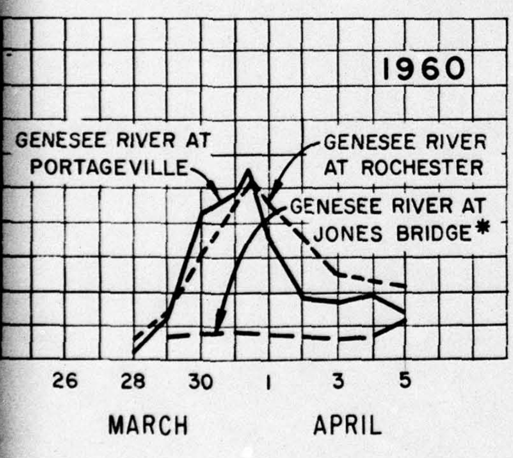
04170

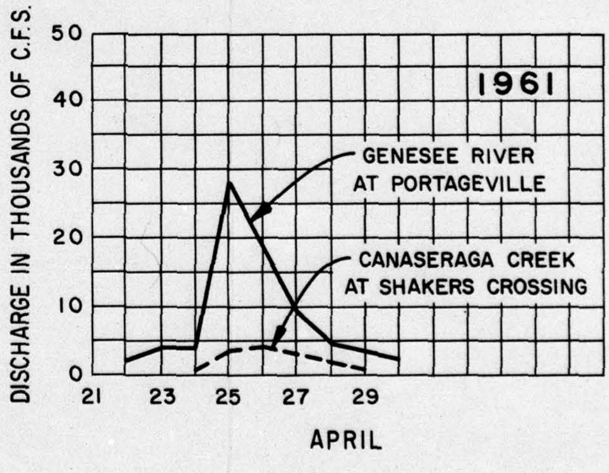
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

2









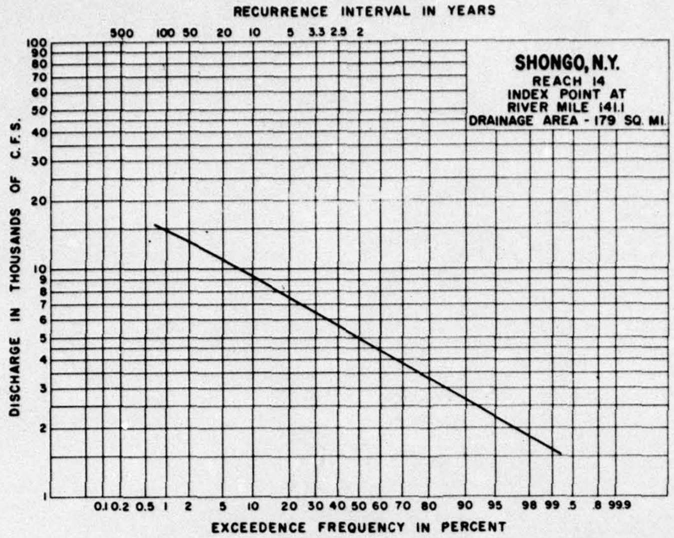
* MODIFIED BY MOUNT MORRIS RESERVOIR

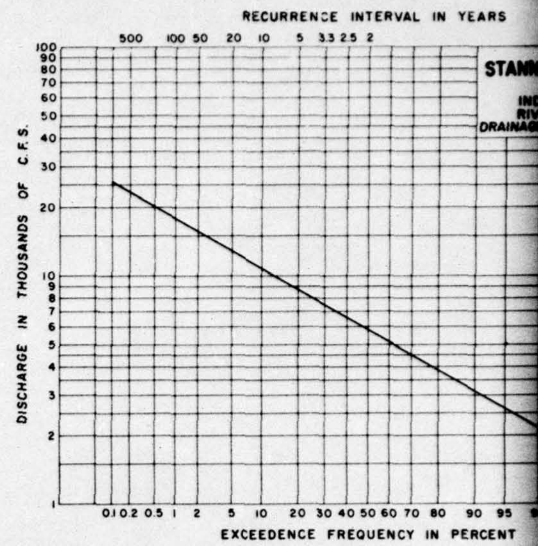
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

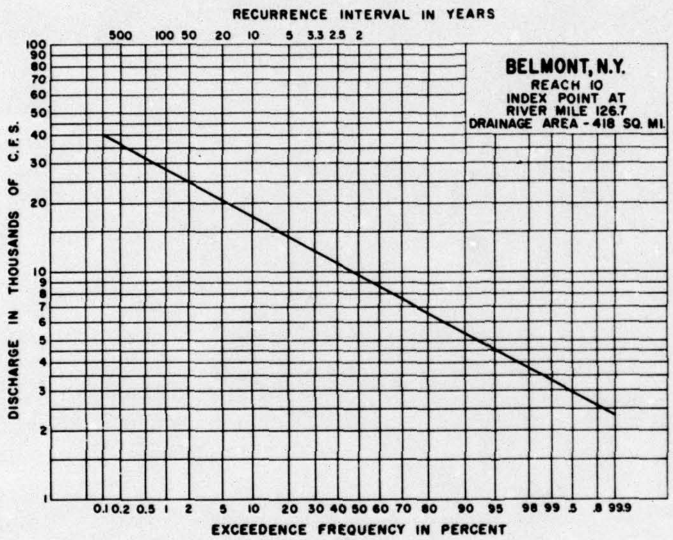
FLOOD HYDROGRAPHS

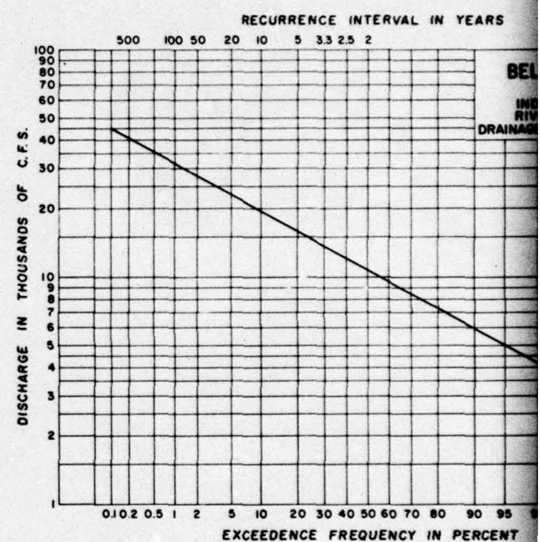
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

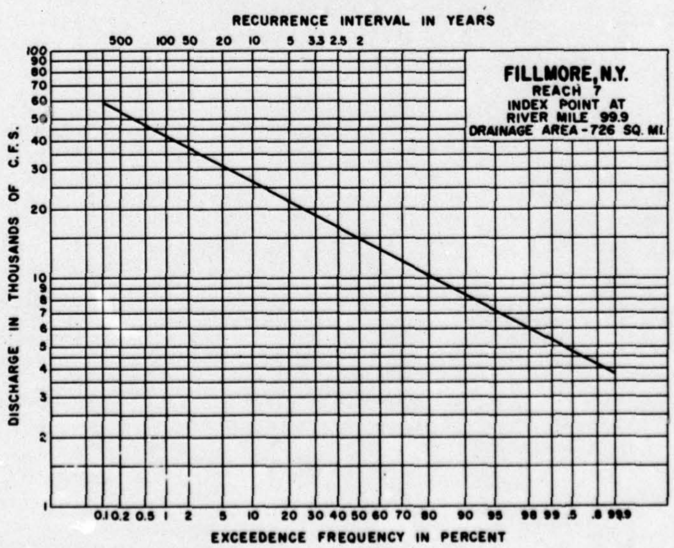
PLATE E13

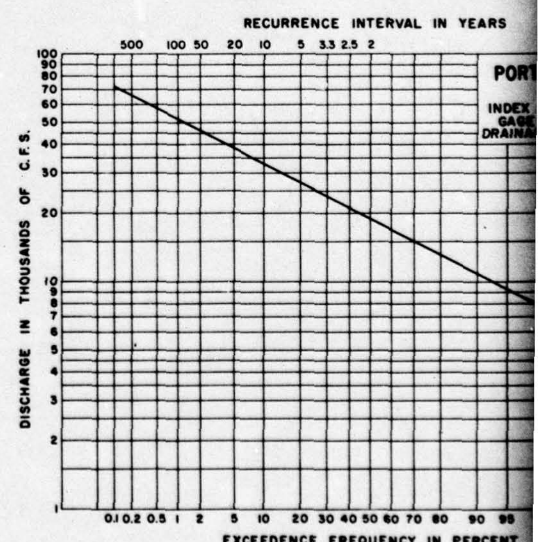

RECURRENCE INTERVAL IN YEARS
SHONGO, N.Y.
REACH 14
INDEX POINT AT
RIVER MILE 141.1
DRAINAGE AREA - 179 SQ. MI.
DISCHARGE IN THOUSANDS OF C.F.S.
EXCEEDENCE FREQUENCY IN PERCENT


RECURRENCE INTERVAL IN YEARS
DISCHARGE IN THOUSANDS OF C.F.S.
EXCEEDENCE FREQUENCY IN PERCENT

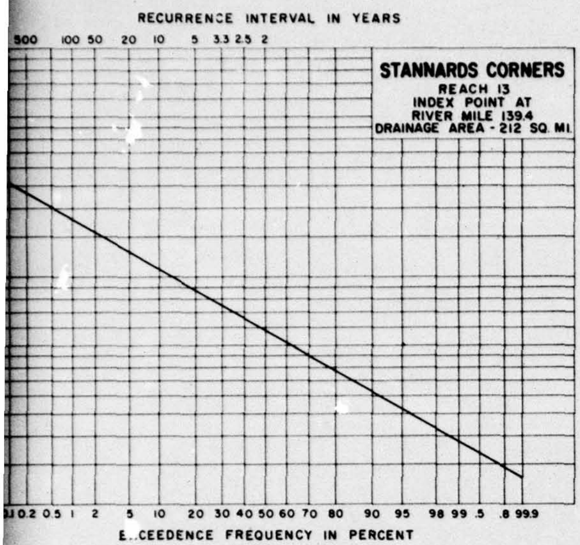

RECURRENCE INTERVAL IN YEARS
BELMONT, N.Y.
REACH 10
INDEX POINT AT
RIVER MILE 126.7
DRAINAGE AREA - 418 SQ. MI.
DISCHARGE IN THOUSANDS OF C.F.S.
EXCEEDENCE FREQUENCY IN PERCENT

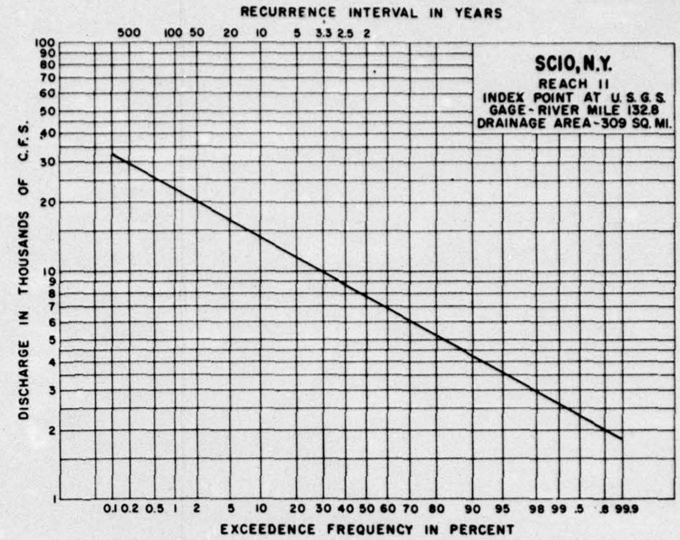

RECURRENCE INTERVAL IN YEARS
DISCHARGE IN THOUSANDS OF C.F.S.
EXCEEDENCE FREQUENCY IN PERCENT

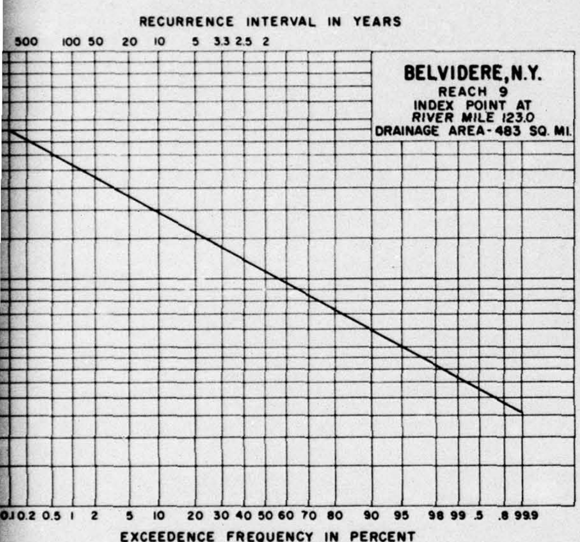

RECURRENCE INTERVAL IN YEARS
FILLMORE, N.Y.
REACH 7
INDEX POINT AT
RIVER MILE 99.9
DRAINAGE AREA - 726 SQ. MI.
DISCHARGE IN THOUSANDS OF C.F.S.
EXCEEDENCE FREQUENCY IN PERCENT

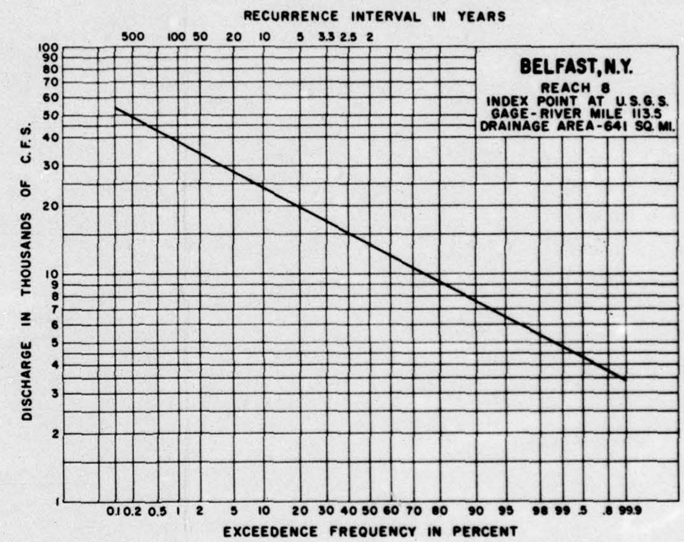

RECURRENCE INTERVAL IN YEARS
DISCHARGE IN THOUSANDS OF C.F.S.
EXCEEDENCE FREQUENCY IN PERCENT

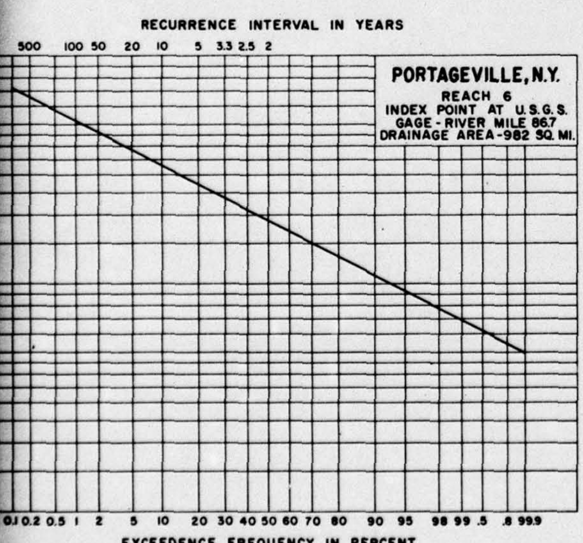
2









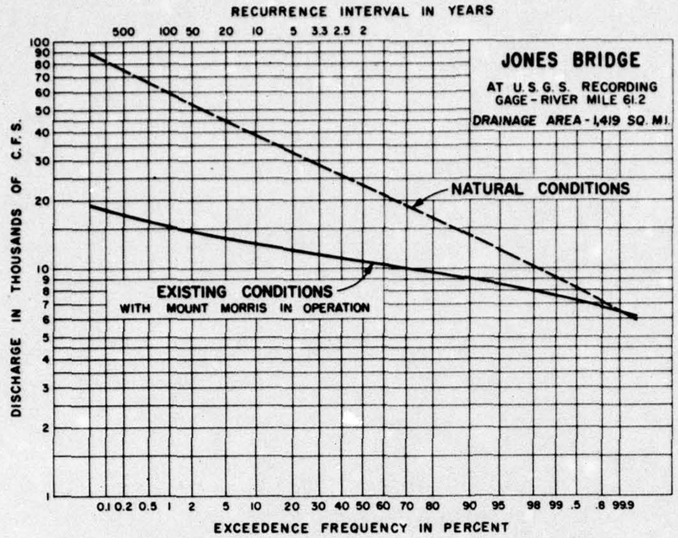


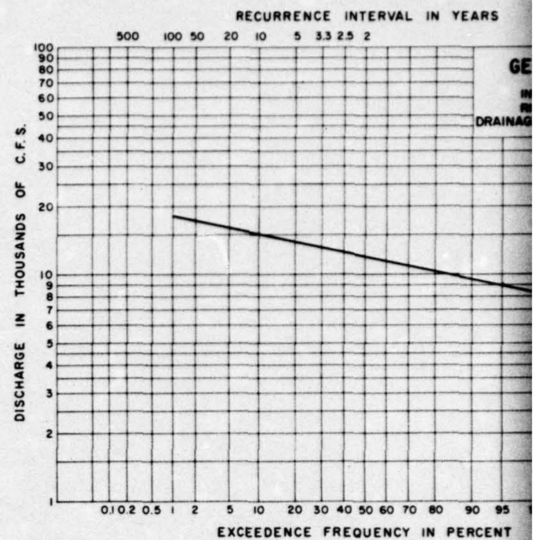
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

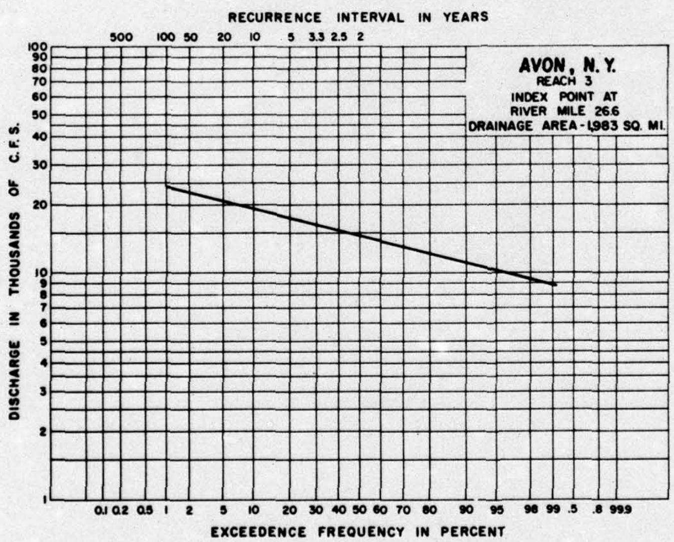
DISCHARGE-FREQUENCY CURVES FOR THE UPPER GENESEE RIVER

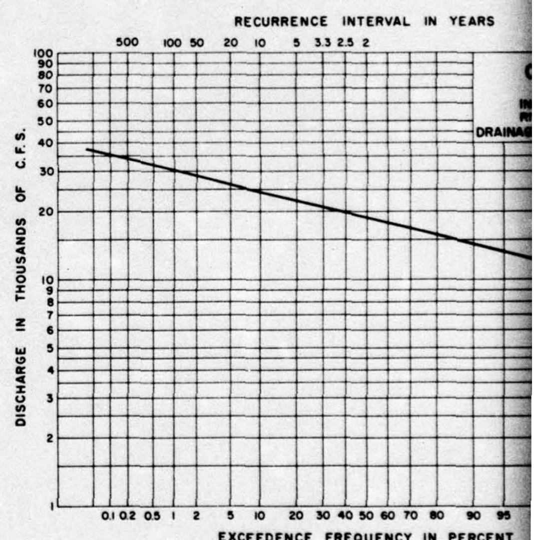
U.S. ARMY ENGINEER DISTRICT, BUFFALO

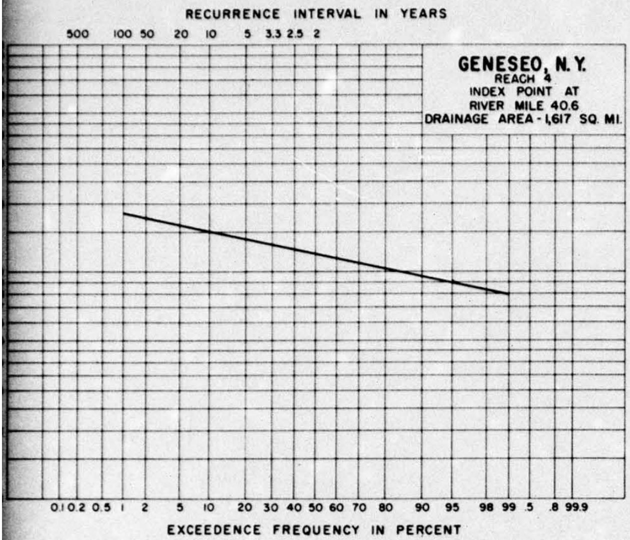
JUNE 1967

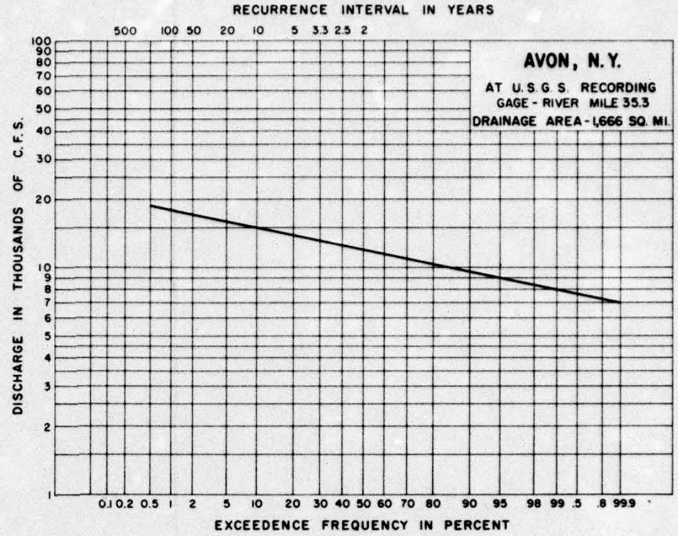

RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
JONES BRIDGE
AT U.S.G.S. RECORDING
GAGE - RIVER MILE 61.2
DRAINAGE AREA - 1,419 SQ. MI.
NATURAL CONDITIONS
EXISTING CONDITIONS
WITH MOUNT MORRIS IN OPERATION
DISCHARGE IN THOUSANDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 .5 .8 99.9
EXCEEDENCE FREQUENCY IN PERCENT

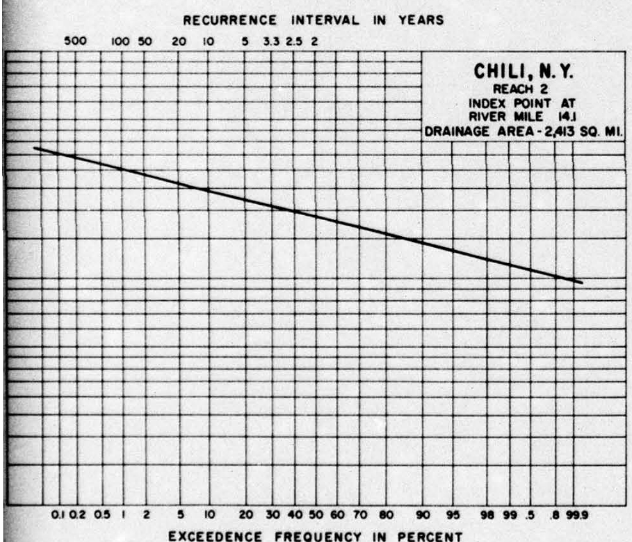

RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
GE
DRAINAG
DISCHARGE IN THOUSANDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95
EXCEEDENCE FREQUENCY IN PERCENT

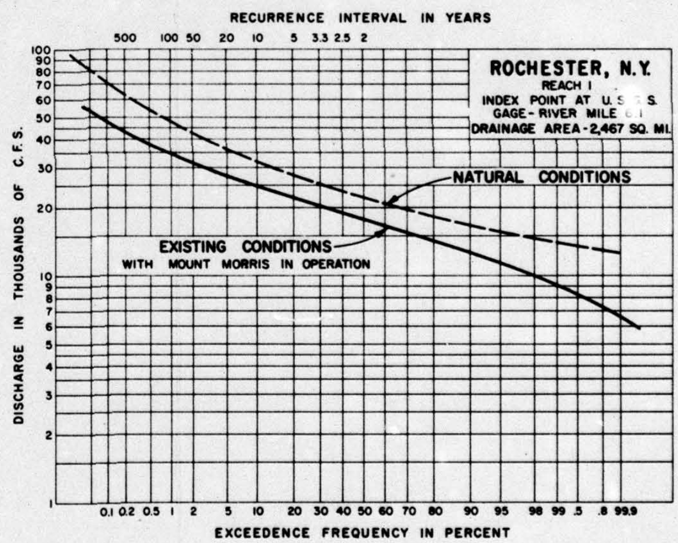

RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
AVON, N.Y.
REACH 3
INDEX POINT AT
RIVER MILE 26.6
DRAINAGE AREA - 1,983 SQ. MI.
DISCHARGE IN THOUSANDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 .5 .8 99.9
EXCEEDENCE FREQUENCY IN PERCENT


RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
DRAINAG
DISCHARGE IN THOUSANDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95
EXCEEDENCE FREQUENCY IN PERCENT







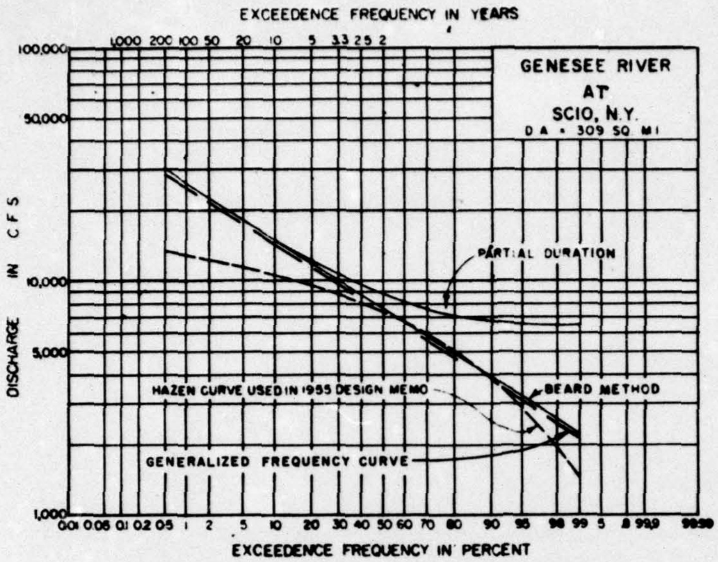


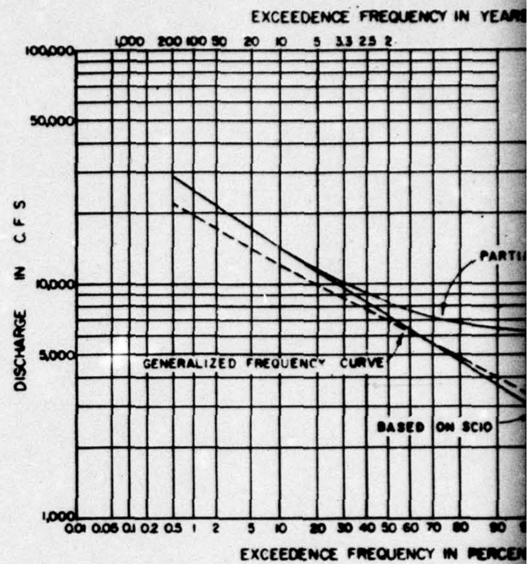
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

DISCHARGE-FREQUENCY CURVES FOR THE LOWER GENESEE RIVER

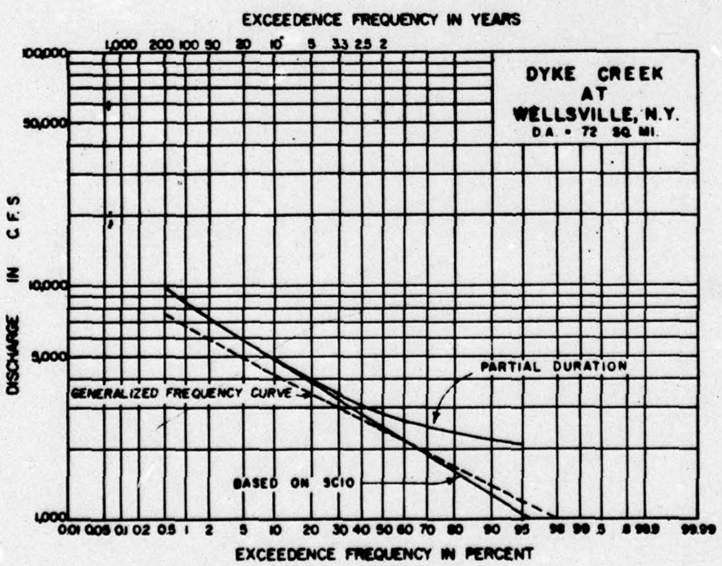
U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967



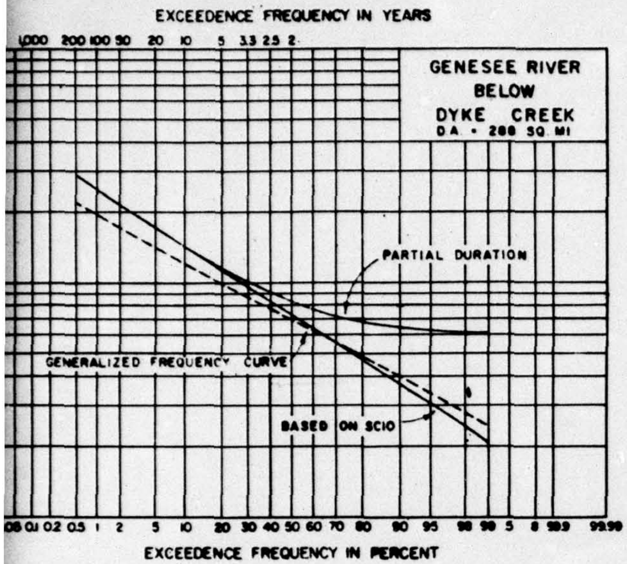


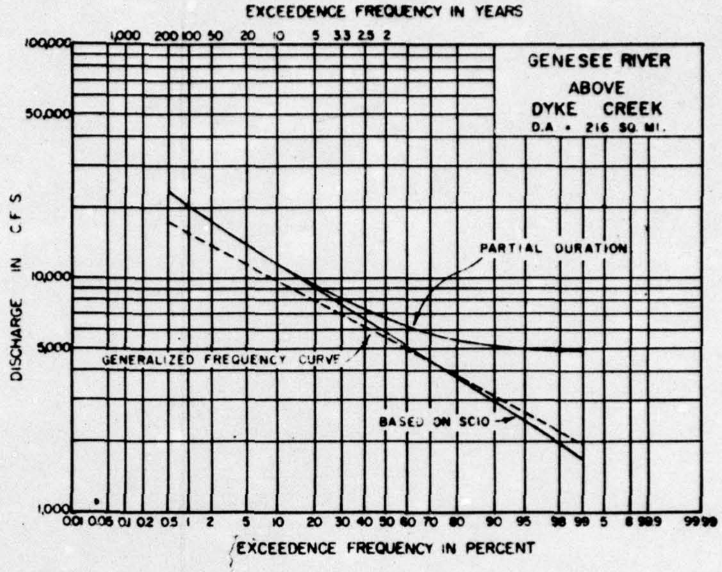
D I S C H A R G E - F R E Q U E



DISCHARGE-FREQUENCY CURVES

2





G E - F R E Q U E N C Y   C U R V E S

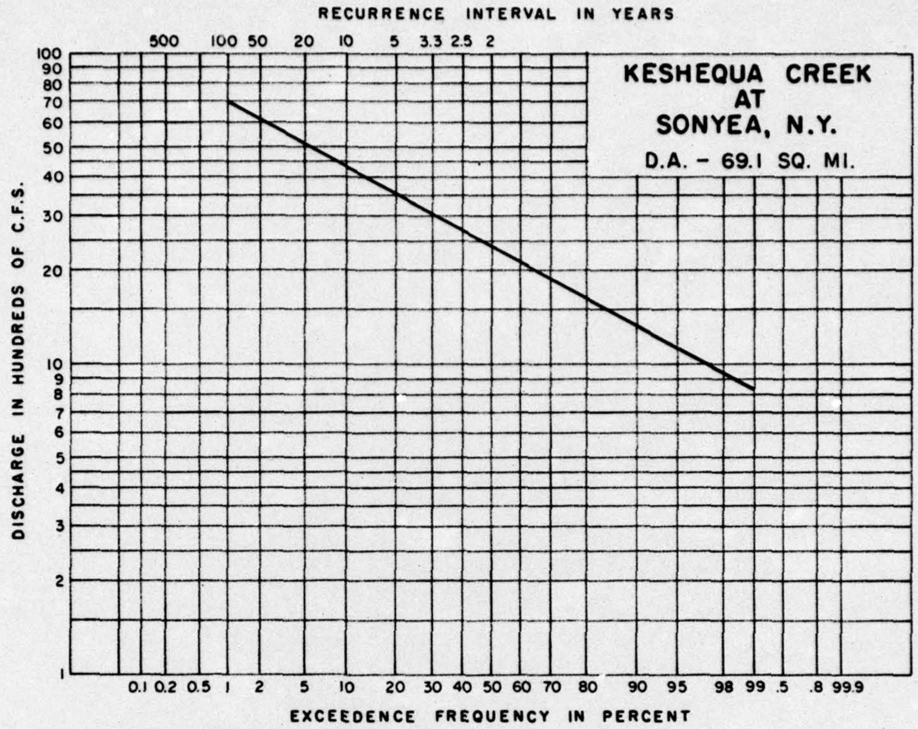
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

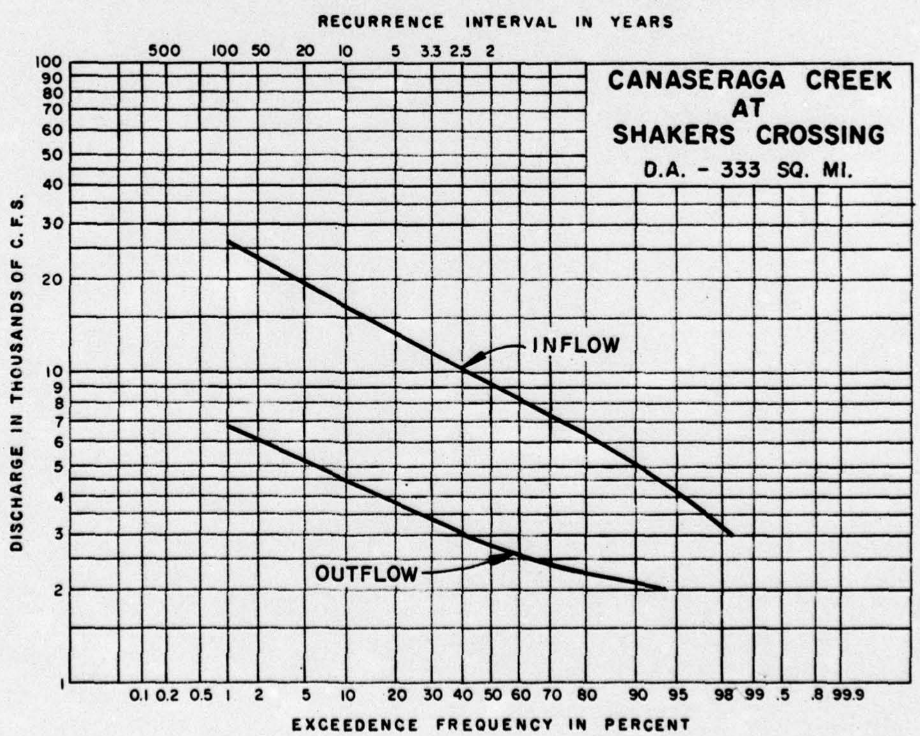
DISCHARGE-FREQUENCY CURVES
WELLSVILLE, NEW YORK

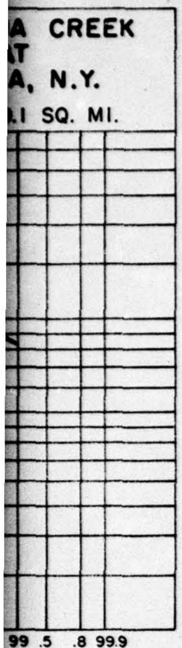
U.S. ARMY ENGINEER DISTRICT, BUFFALO

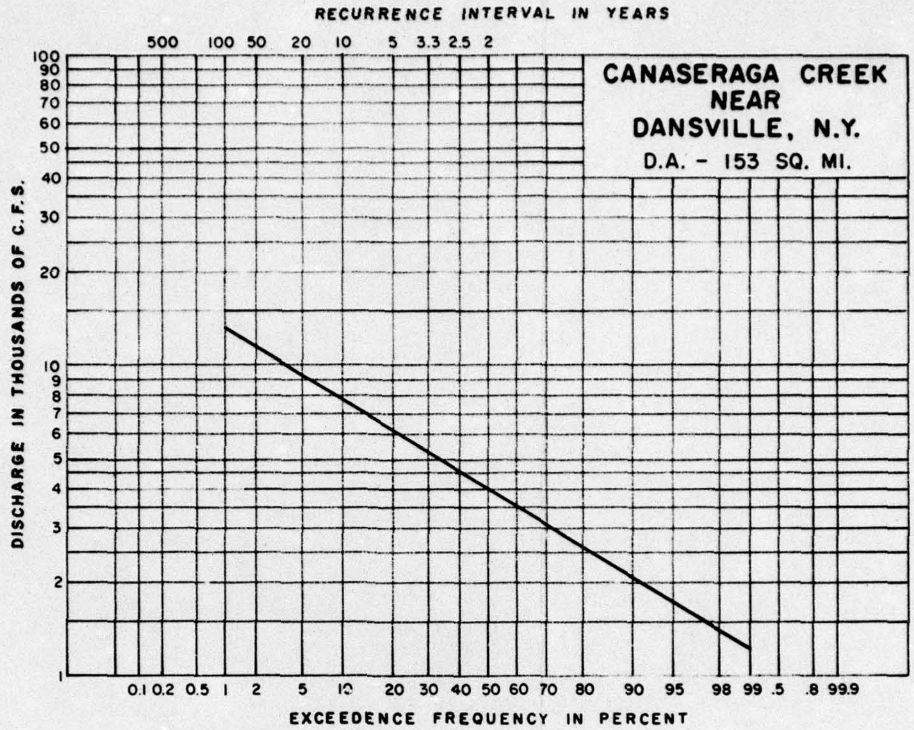
JUNE 1967

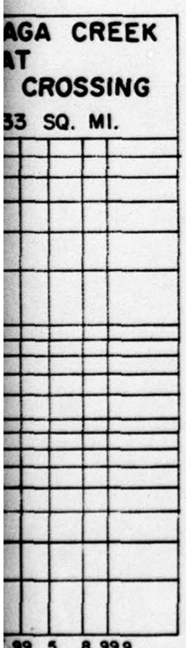
PLATE E16


RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
KESHEQUA CREEK
AT
SONYEA, N.Y.
D.A. - 69.1 SQ. MI.
DISCHARGE IN HUNDREDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 .5 .8 99.9
EXCEEDENCE FREQUENCY IN PERCENT


RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
CANASERAGA CREEK
AT
SHAKERS CROSSING
D.A. - 333 SQ. MI.
DISCHARGE IN THOUSANDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
INFLOW
OUTFLOW
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 .5 .8 99.9
EXCEEDENCE FREQUENCY IN PERCENT



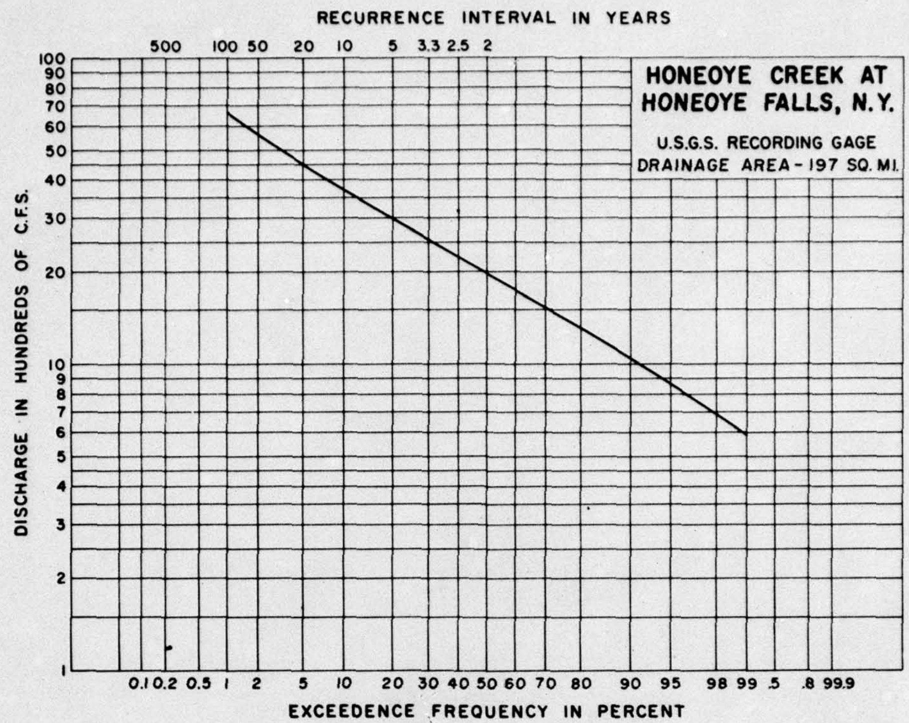


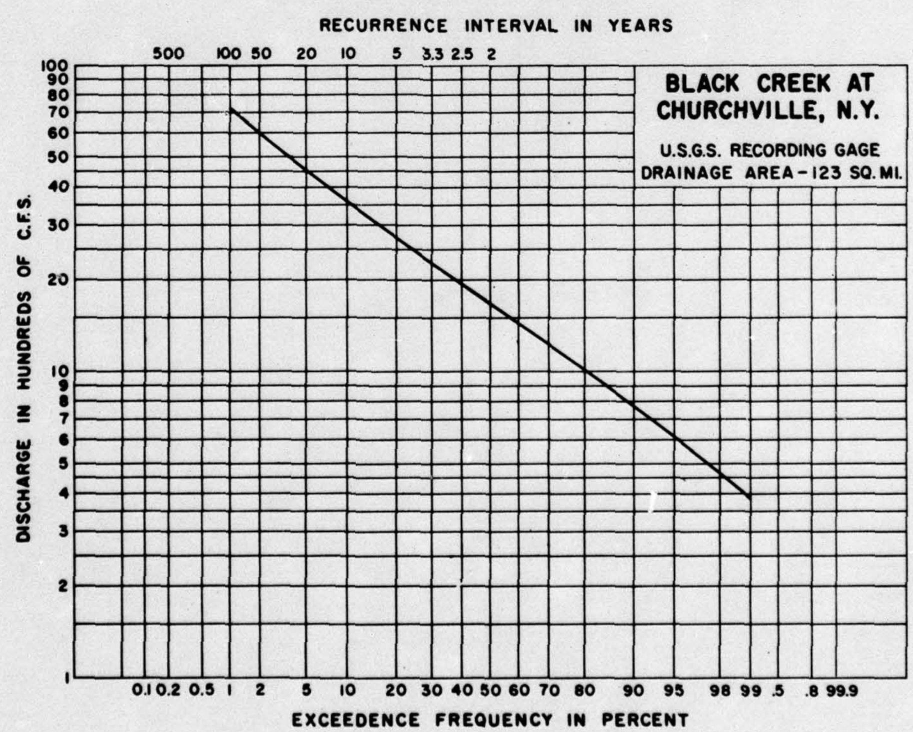


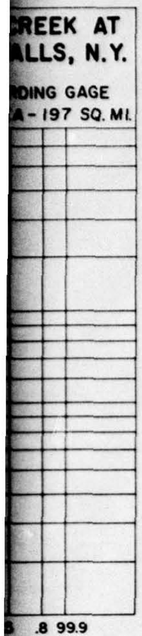
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

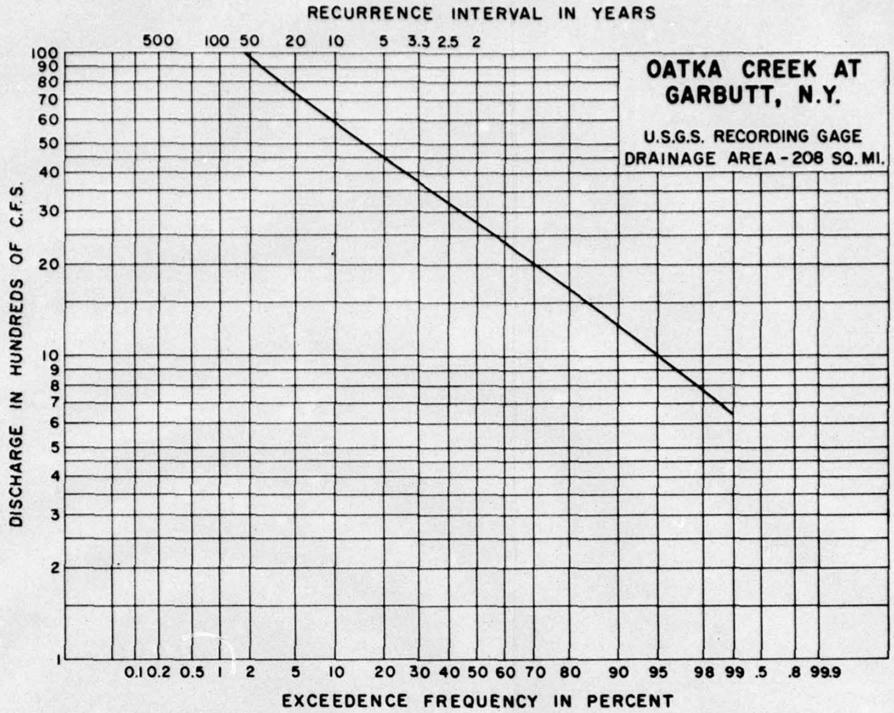
DISCHARGE - FREQUENCY CURVES
CANASERAGA BASIN

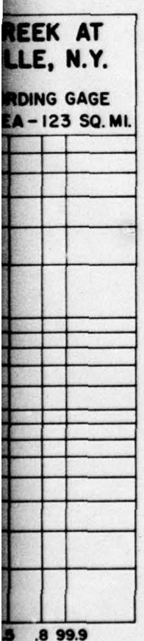
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967


RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
HONEOYE CREEK AT HONEOYE FALLS, N.Y.
U.S.G.S. RECORDING GAGE
DRAINAGE AREA - 197 SQ. MI.
DISCHARGE IN HUNDREDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 .5 .8 99.9
EXCEEDENCE FREQUENCY IN PERCENT


RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
BLACK CREEK AT CHURCHVILLE, N.Y.
U.S.G.S. RECORDING GAGE
DRAINAGE AREA - 123 SQ. MI.
DISCHARGE IN HUNDREDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 .5 .8 99.9
EXCEEDENCE FREQUENCY IN PERCENT







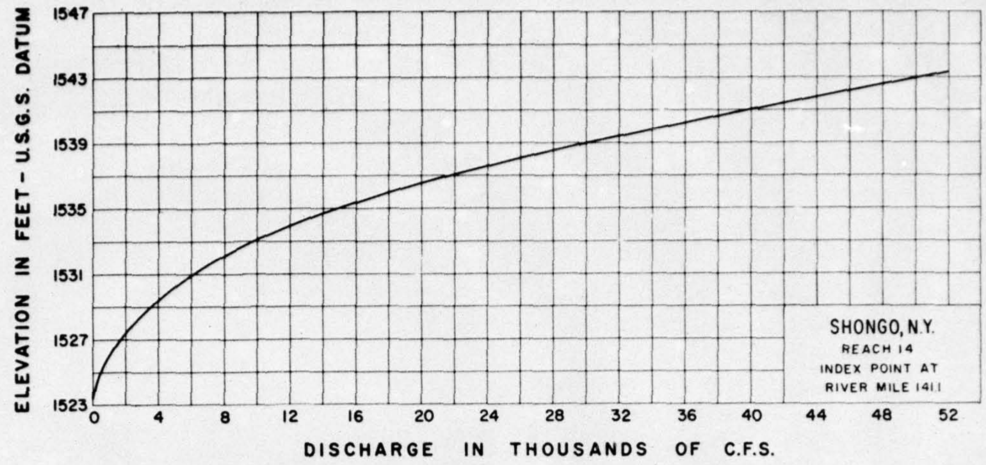
GENESEE RIVER BASIN
COMPREHENSIVE STUDY

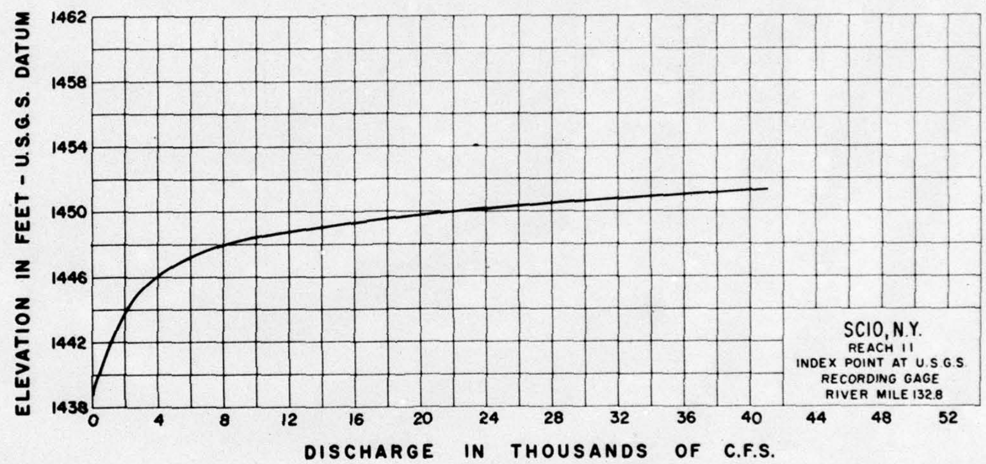
NEW YORK AND PENNSYLVANIA

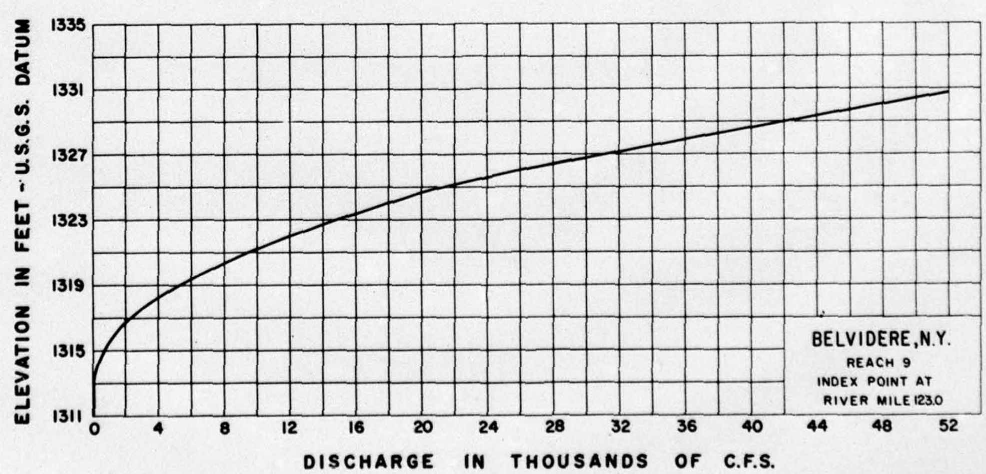
DISCHARGE-FREQUENCY CURVES FOR TRIBUTARIES OF THE GENESEE RIVER

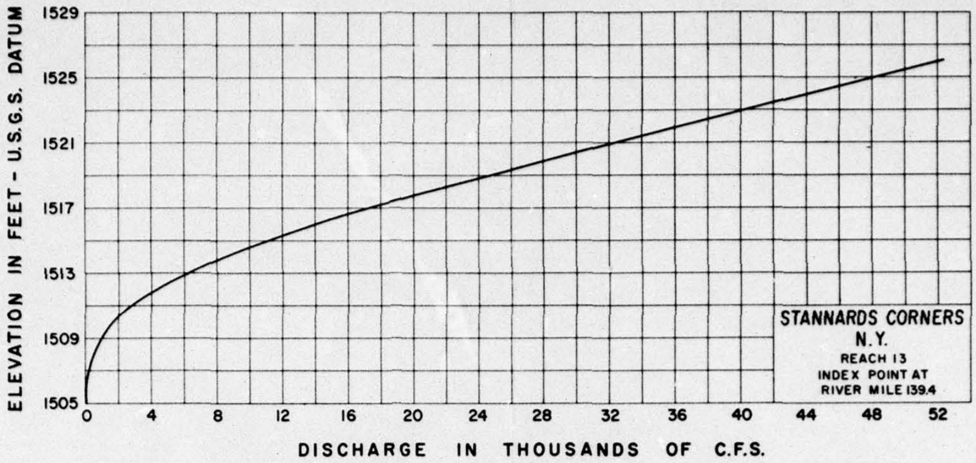
U. S. ARMY ENGINEER DISTRICT, BUFFALO

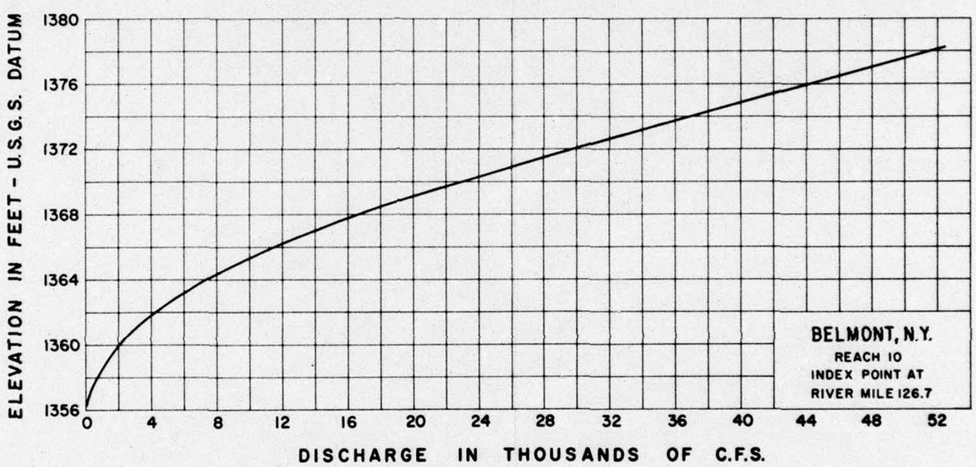
JUNE 1967

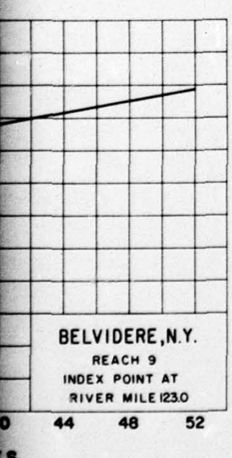

ELEVATION IN FEET - U.S.G.S. DATUM
1547
1543
1539
1535
1531
1527
1523
0 4 8 12 16 20 24 28 32 36 40 44 48 52
DISCHARGE IN THOUSANDS OF C.F.S.
SHONGO, N.Y.
REACH 14
INDEX POINT AT
RIVER MILE 141.1


ELEVATION IN FEET - U.S.G.S. DATUM
1462
1458
1454
1450
1446
1442
1438
0 4 8 12 16 20 24 28 32 36 40 44 48 52
DISCHARGE IN THOUSANDS OF C.F.S.
SCIO, N.Y.
REACH 11
INDEX POINT AT U.S.G.S.
RECORDING GAGE
RIVER MILE 132.8


ELEVATION IN FEET - U.S.G.S. DATUM
1335
1331
1327
1323
1319
1315
1311
0 4 8 12 16 20 24 28 32 36 40 44 48 52
DISCHARGE IN THOUSANDS OF C.F.S.
BELVIDERE, N.Y.
REACH 9
INDEX POINT AT
RIVER MILE 123.0





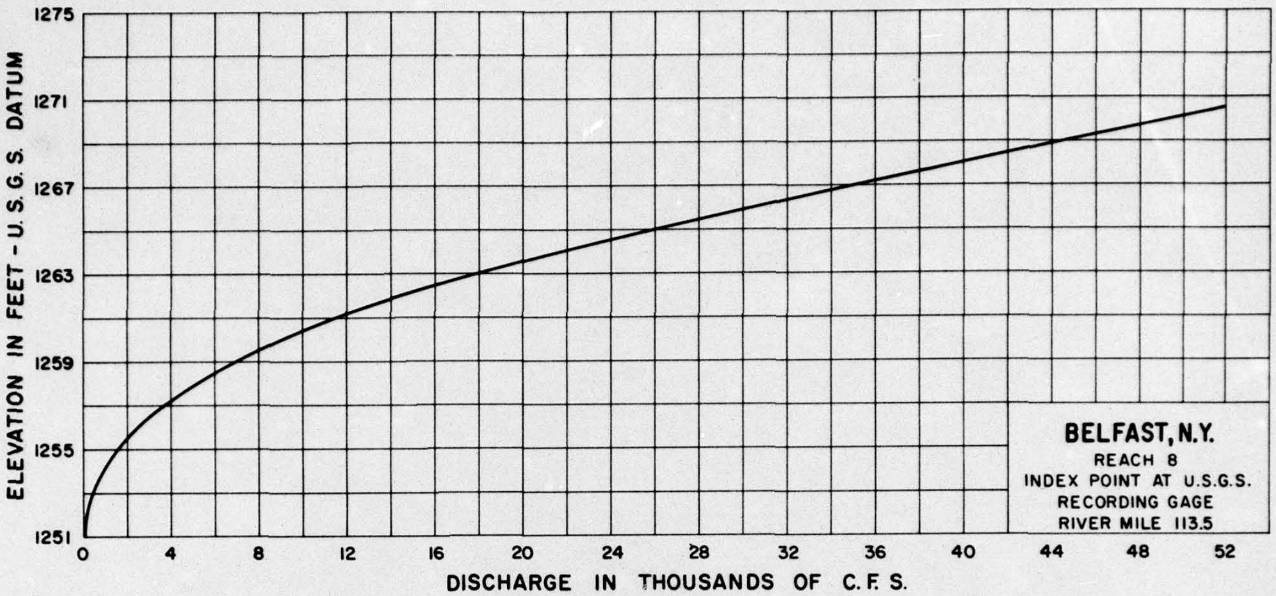


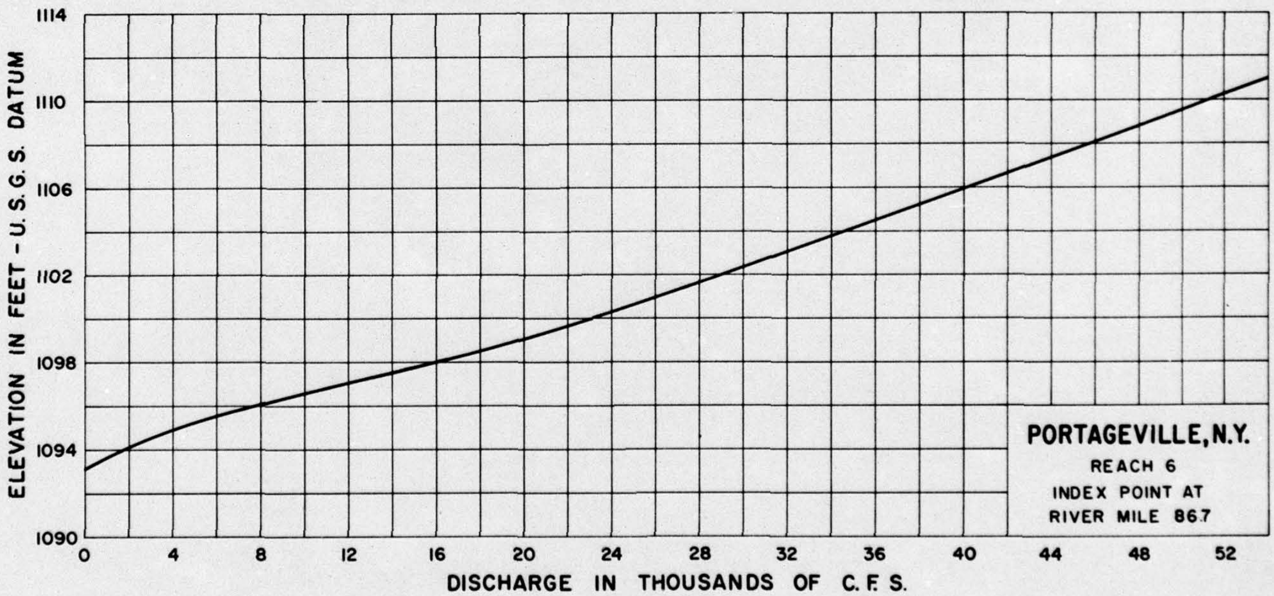
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STAGE-DISCHARGE CURVES FOR THE UPPER GENESEE RIVER

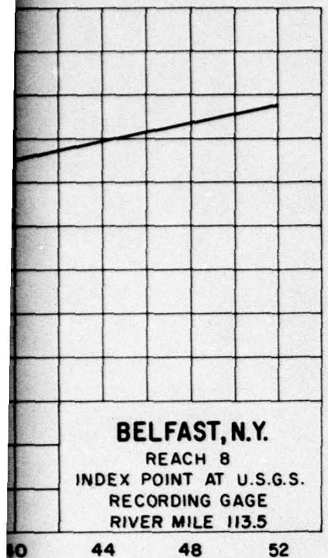
U.S ARMY ENGINEER DISTRICT, BUFFALO

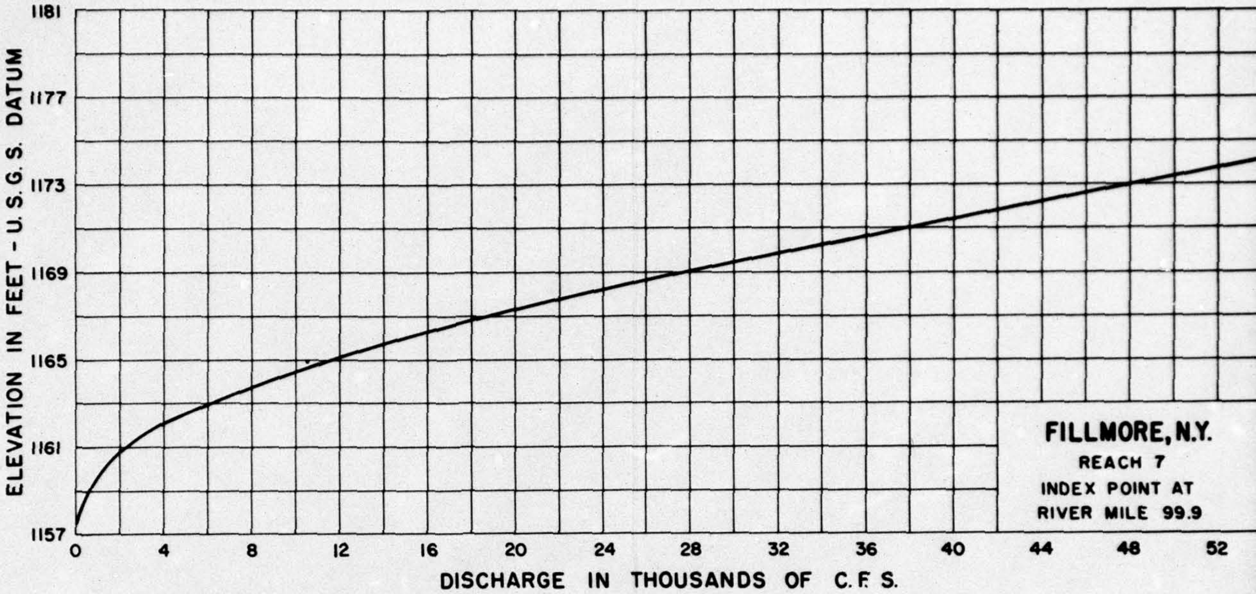
JUNE 1967

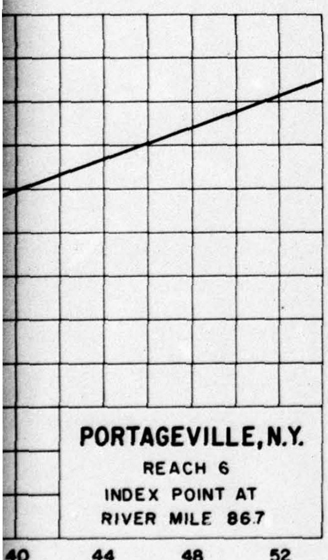

ELEVATION IN FEET - U.S.G.S. DATUM
1275
1271
1267
1263
1259
1255
1251
0
4
8
12
16
20
24
28
32
36
40
44
48
52
DISCHARGE IN THOUSANDS OF C.F.S.
BELFAST, N.Y.
REACH 8
INDEX POINT AT U.S.G.S.
RECORDING GAGE
RIVER MILE 113.5


ELEVATION IN FEET - U.S.G.S. DATUM
1114
1110
1106
1102
1098
1094
1090
0
4
8
12
16
20
24
28
32
36
40
44
48
52
DISCHARGE IN THOUSANDS OF C.F.S.
PORTAGEVILLE, N.Y.
REACH 6
INDEX POINT AT
RIVER MILE 86.7

2







GENESEE RIVER BASIN
COMPREHENSIVE STUDY

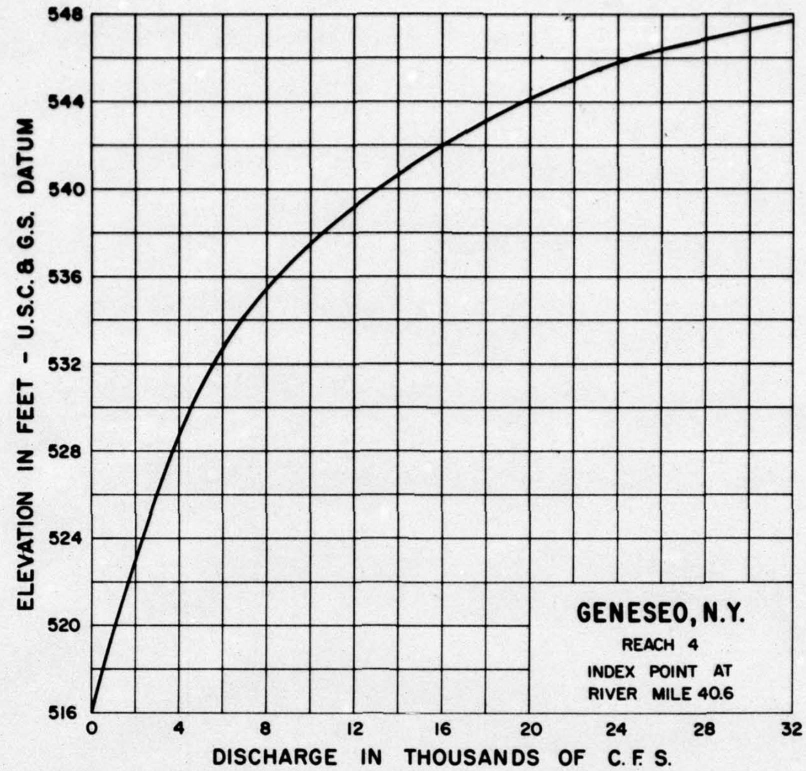
NEW YORK AND PENNSYLVANIA

STAGE-DISCHARGE CURVES FOR THE UPPER GENESEE RIVER

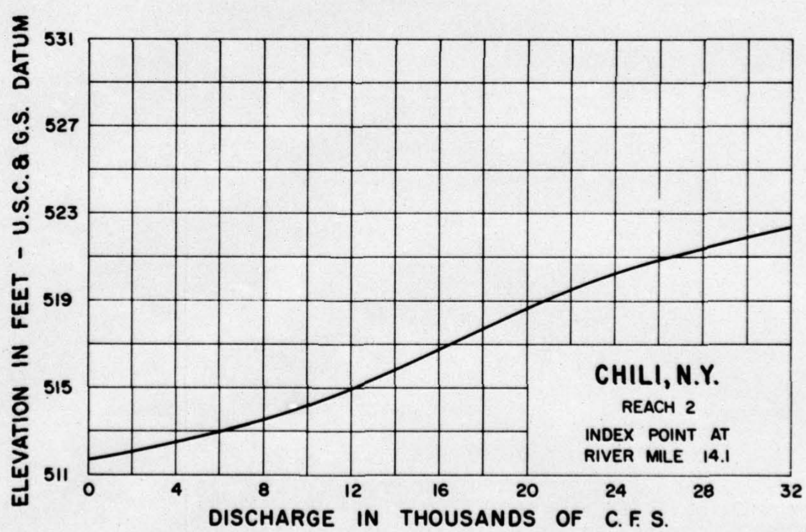
U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

PLATE E

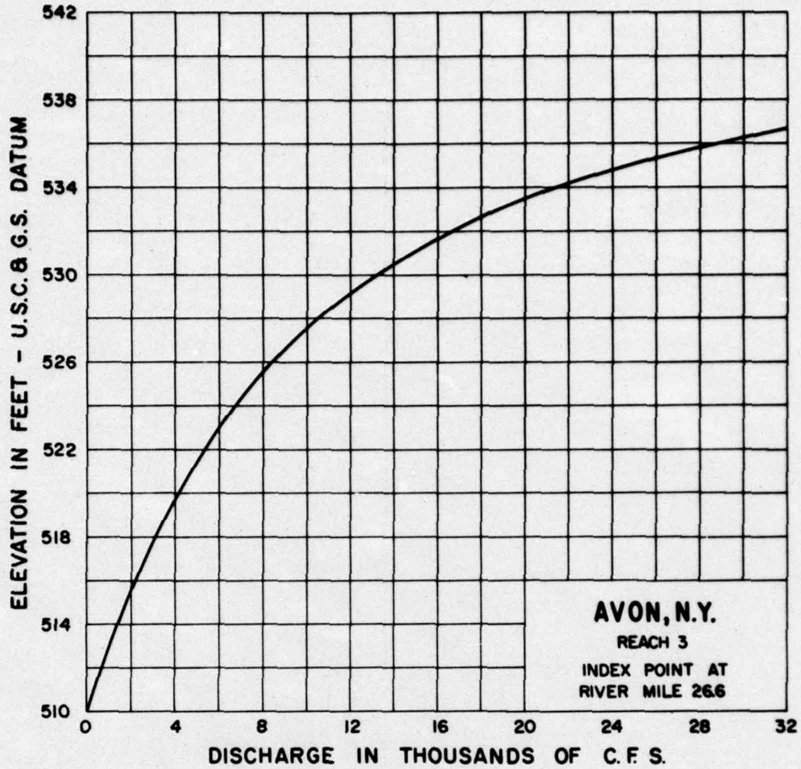


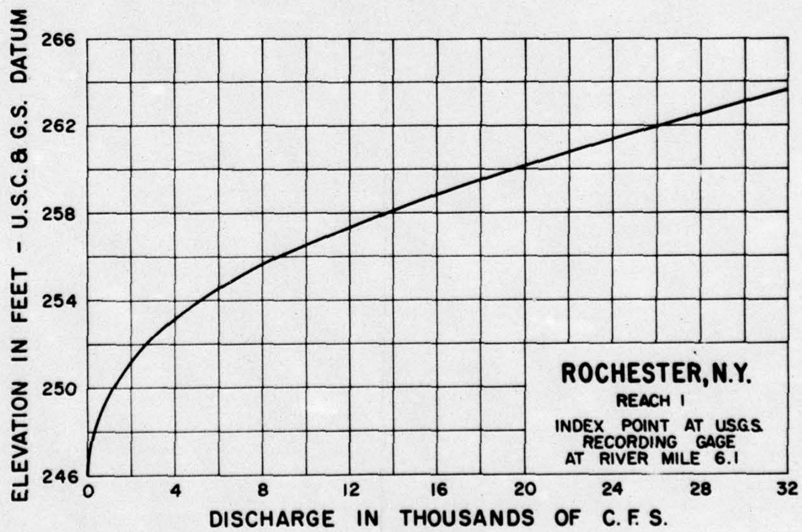
548
544
540
536
532
528
524
520
516
ELEVATION IN FEET - U.S.C.& G.S. DATUM
0
4
8
12
16
20
24
28
32
DISCHARGE IN THOUSANDS OF C.F.S.
GENESEO, N.Y.
REACH 4
INDEX POINT AT
RIVER MILE 40.6



531
527
523
519
515
511
ELEVATION IN FEET - U.S.C.& G.S. DATUM
0
4
8
12
16
20
24
28
32
DISCHARGE IN THOUSANDS OF C.F.S.
CHILI, N.Y.
REACH 2
INDEX POINT AT
RIVER MILE 14.1

2





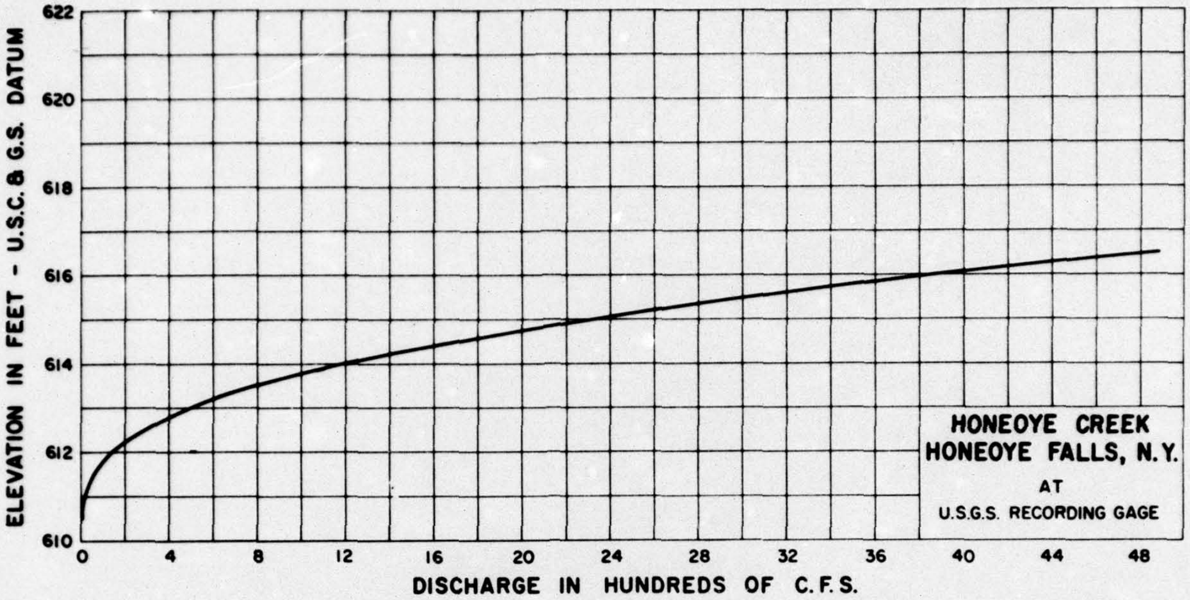
GENESEE RIVER BASIN
COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

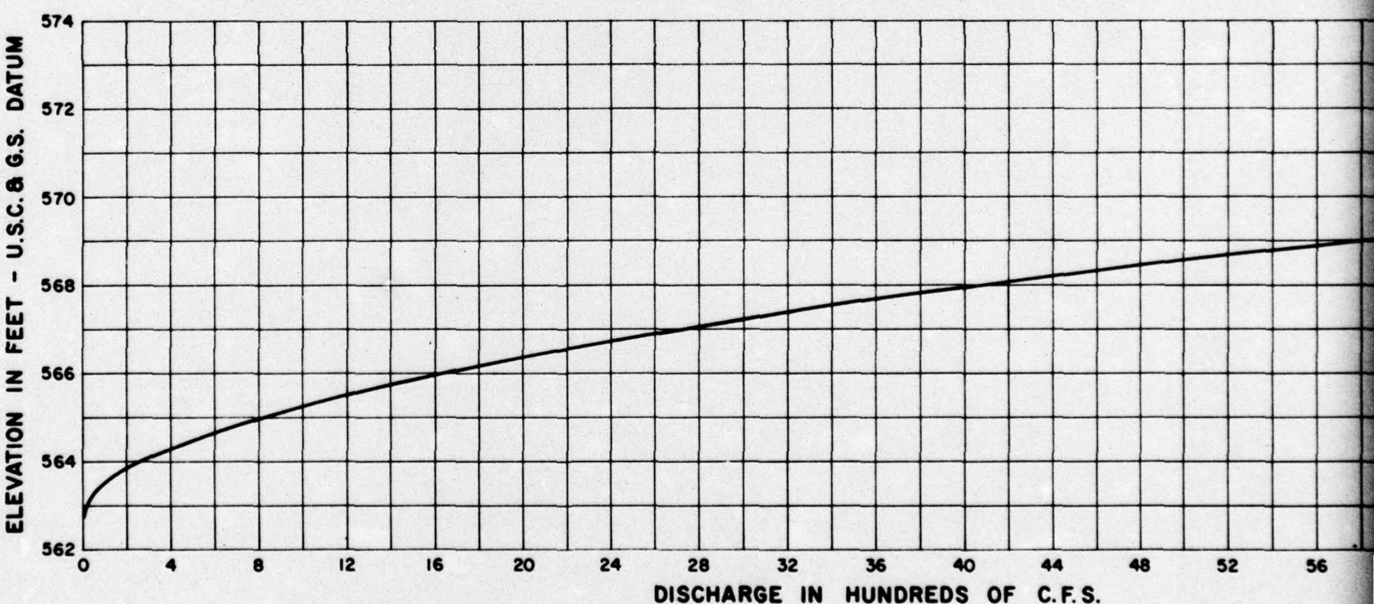
STAGE-DISCHARGE CURVES FOR THE LOWER GENESEE RIVER

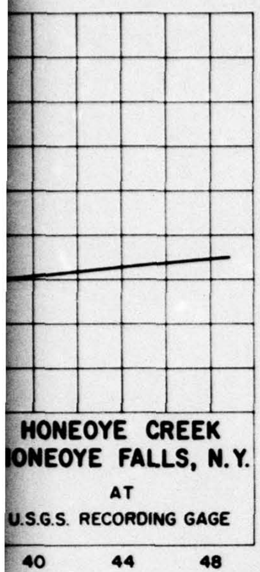
U.S. ARMY ENGINEER DISTRICT, BUFFALO

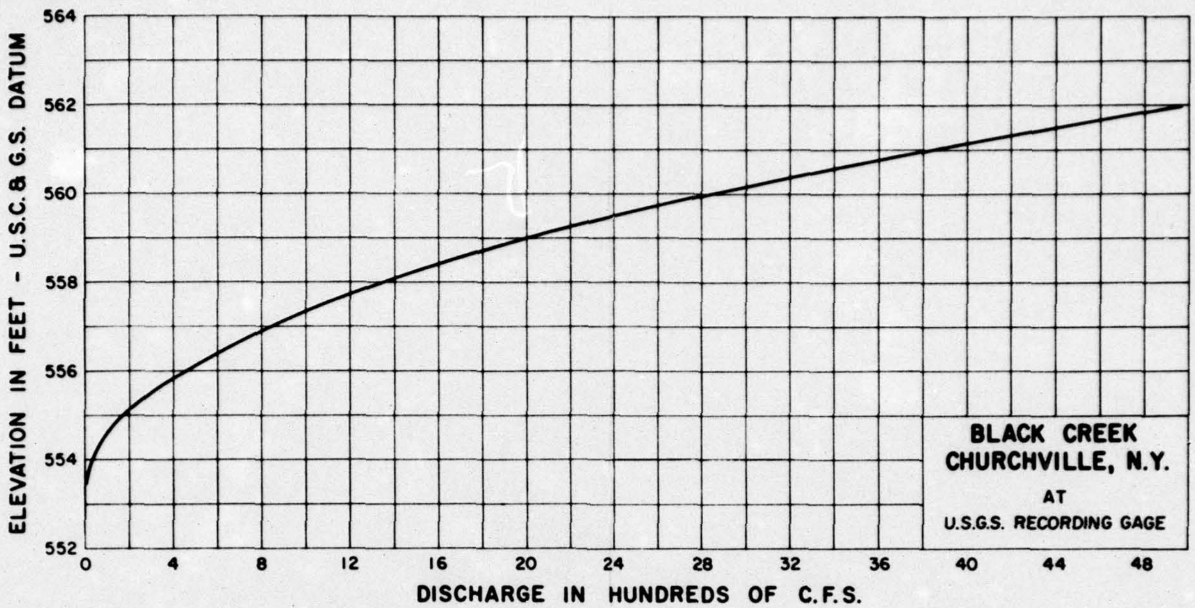
JUNE 1967

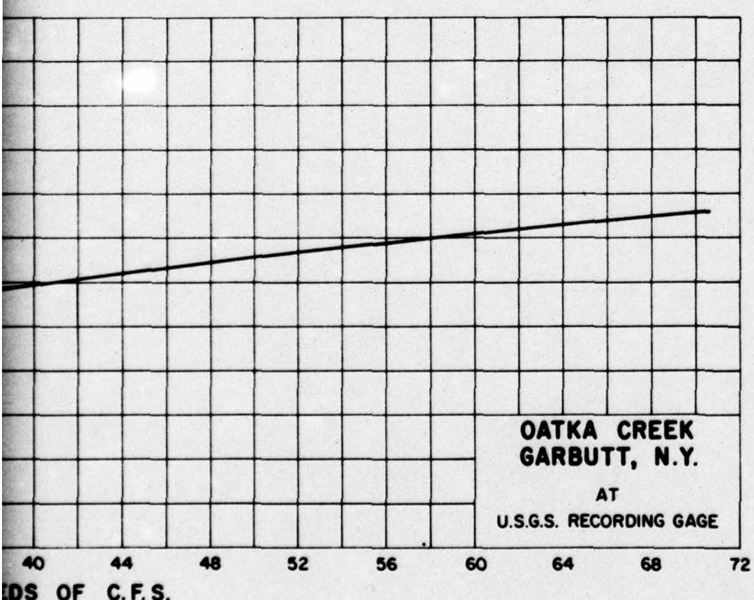

ELEVATION IN FEET - U.S.C.& G.S. DATUM
610
612
614
616
618
620
622
0
4
8
12
16
20
24
28
32
36
40
44
48
DISCHARGE IN HUNDREDS OF C.F.S.
HONEOYE CREEK
HONEOYE FALLS, N.Y.
AT
U.S.G.S. RECORDING GAGE


ELEVATION IN FEET - U.S.C.& G.S. DATUM
552
554
556
558
560
562
564
0


ELEVATION IN FEET - U.S.C.& G.S. DATUM
562
564
566
568
570
572
574
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
DISCHARGE IN HUNDREDS OF C.F.S.







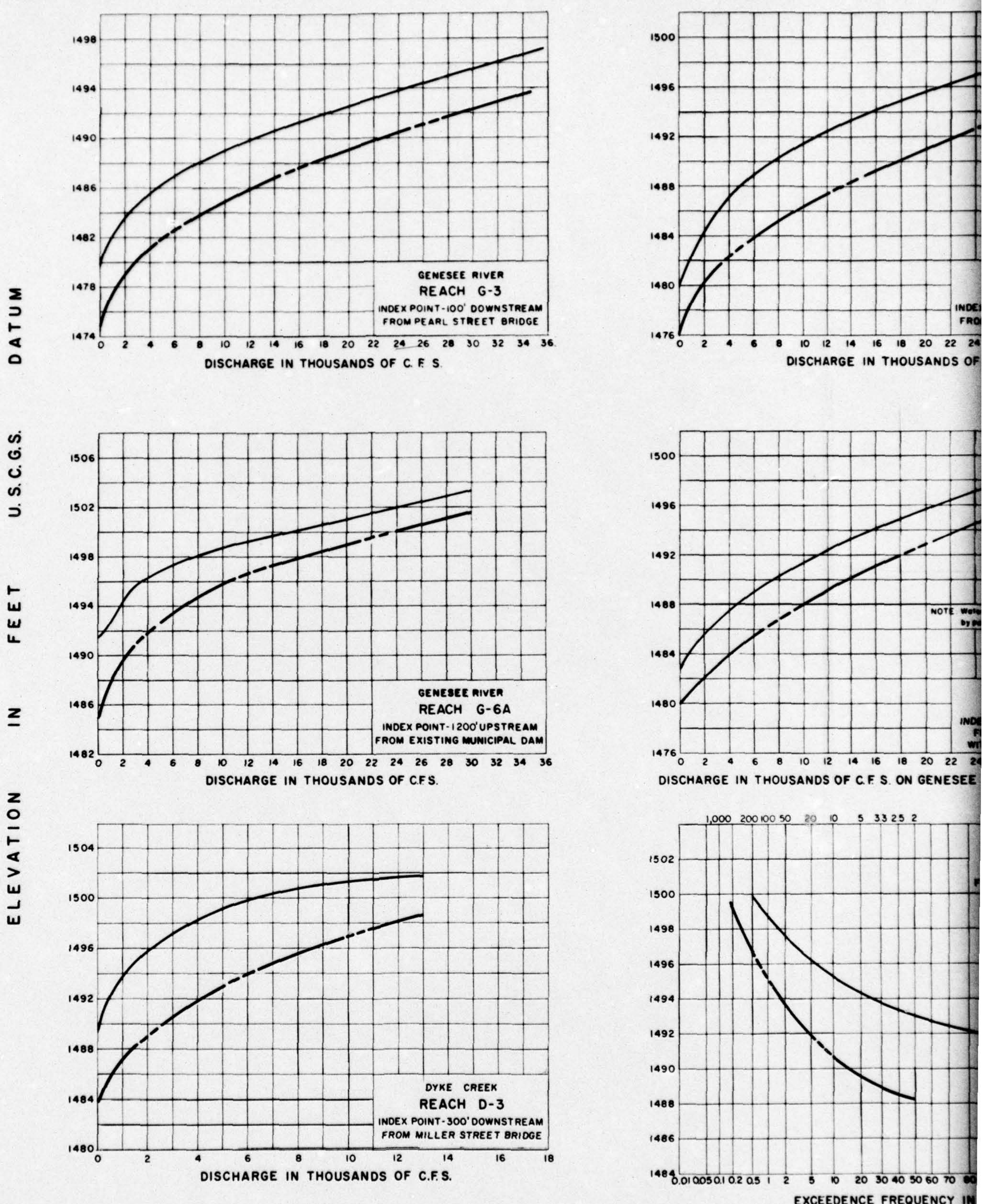
GENESEE RIVER BASIN
COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

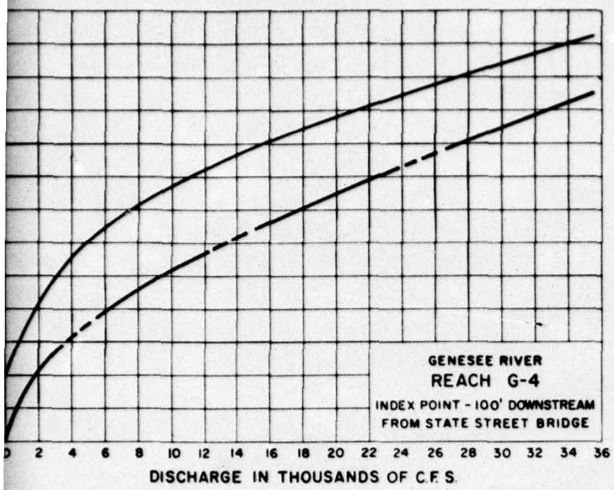
STAGE-DISCHARGE CURVES FOR TRIBUTARIES OF THE GENESEE RIVER

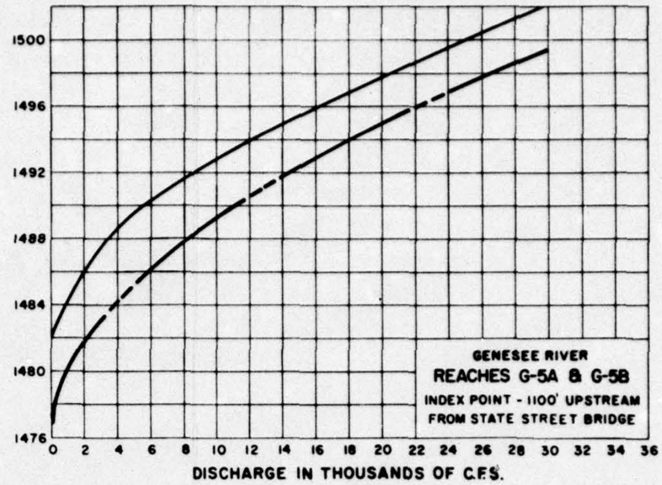
U. S. ARMY ENGINEER DISTRICT, BUFFALO

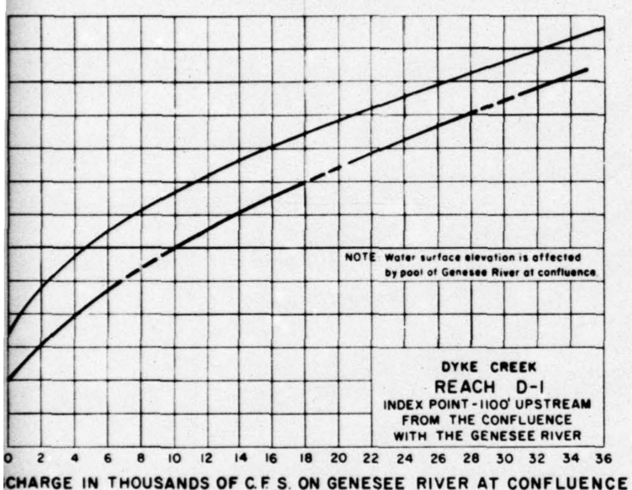
JUNE 1967

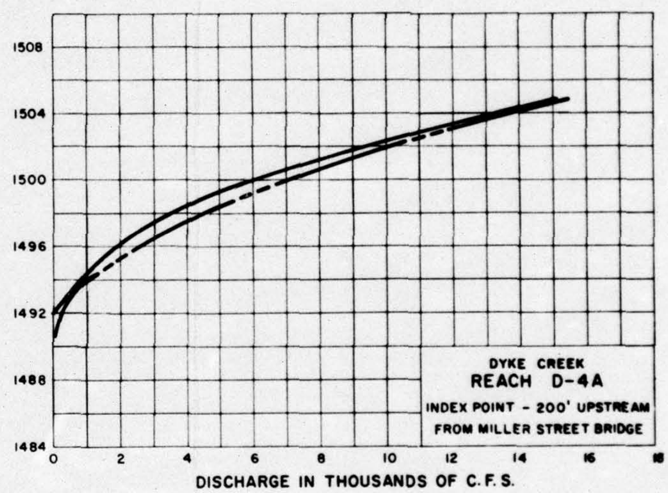

ELEVATION IN FEET U.S.C.G.S. DATUM
GENESEE RIVER
REACH G-3
INDEX POINT-100' DOWNSTREAM
FROM PEARL STREET BRIDGE
DISCHARGE IN THOUSANDS OF C.F.S.
GENESEE RIVER
REACH G-6A
INDEX POINT-1200' UPSTREAM
FROM EXISTING MUNICIPAL DAM
DISCHARGE IN THOUSANDS OF C.F.S.
DYKE CREEK
REACH D-3
INDEX POINT-300' DOWNSTREAM
FROM MILLER STREET BRIDGE
DISCHARGE IN THOUSANDS OF C.F.S.
DISCHARGE IN THOUSANDS OF
DISCHARGE IN THOUSANDS OF C.F.S. ON GENESEE
EXCEEDENCE FREQUENCY IN

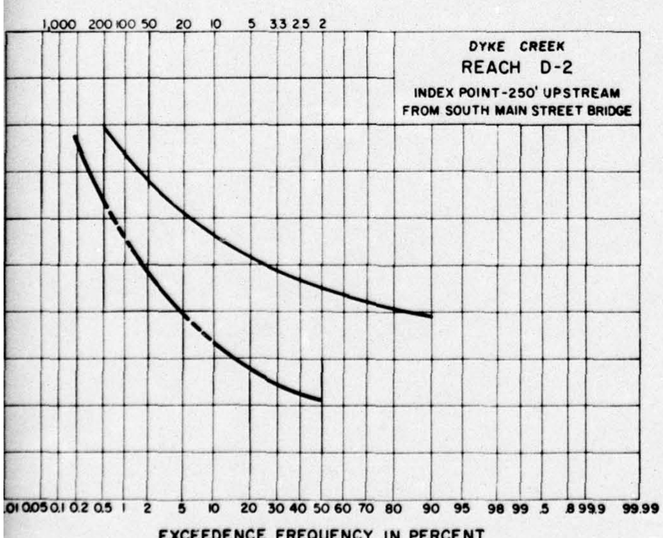
2











LEGEND:

——— NATURAL CONDITIONS - CONDITIONS PRIOR TO THE 1955 PROJECT.

—·--- IMPROVED CONDITIONS - CONDITIONS UNDER PROPOSED 1967 PLAN OF IMPROVEMENT.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STAGE-DISCHARGE AND STAGE FREQUENCY CURVES
WELLSVILLE, NEW YORK

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

GENESEE RIVER BASIN

COMPREHENSIVE

STUDY OF

WATER AND RELATED LAND RESOURCES

APPENDIX E - HYDROLOGY

DETAILED HYDROLOGY ATTACHMENT

TABLE OF CONTENTS

TABLES

TABLES (Cont'd)

PLATE

FIGURES

INTRODUCTION

1A. GENERAL

This attachment has been prepared as a guide for anyone interested in the detailed procedures and methods used in computing the hydrology data given in the main report. Paragraphs, tables, figures and plates in this attachment are designated respectively as E1A, table E1A figure E1A and plate E1A. Reference to paragraphs, tables, figures and plates of the main appendix are designated as E1, table E1, figure E1 and plate E1. A superscript following a word, such as Beard's[6], is a reference to the Bibliography of the main appendix.

CLIMATOLOGICAL RECORDS

2A. CLIMATOLOGY

Climatological data is the basis for much of the hydrology of the main report. Table E1A tabulates the stations at which various data are available, and plate E1A shows the stations in relation to the Genesee River basin.

TABLE E1A - Climatological stations

Station (N. Y. unless noted)	West Latitude	North Longitude	Temp.	Non-Recording Precip.	Recording Precip.	Snow-fall
Alfred	42° 16'	77° 47'	X	X		X
Allegany St. Pk.	42° 06'	78° 45'	X	X		
Angelica	42° 18'	78° 02'	X	X		
Arcade	42° 32'	78° 25'	X	X		X
Avon	42° 55'	77° 45'		X		
Batavia	43° 00'	78° 11'	X	X		
Bolivar	42° 04'	78° 10'			X	
Bristol Springs	42° 43'	77° 22'		X		

Station (N. Y. unless noted)	West Latitude	North Longitude	Temp.	Non-Recording Precip.	Recording Precip.	Snow-fall
Buffalo WB Airport	42° 56'	78° 44'	X	X	X	X
Canandaigua	42° 51'	77° 17'	X	X		
Canaseraga	42° 28'	77° 47'		X		
Churchville	43° 06'	77° 53'		X		
Colden IN	42° 40'	78° 41'	X	X	X	X
Cohocton SCS	42° 28'	77° 30'		X		
Dansville	42° 34'	77° 47'	X	X		X
Dunkirk Power Plant	42° 49'	79° 21'			X	
East Bloomfiled	42° 54'	77° 26'		X	X	
Franklinville	42° 21'	78° 27'		X		
Fredonia	42° 25'	79° 18'	X	X		
Friendship 5 SW	42° 10'	78° 12'		X		X
Garbutt	43° 00'	77° 47'		X		
Gowanda State Hospital	42° 29'	78° 56'	X	X		
Groveland	42° 40'	77° 46'		X		
Hammondsport IS	42° 24'	77° 13'		X		
Haskinville	42° 25'	77° 34'		X		
Hemlock	42° 47'	77° 37'	X	X		
Honeoye Falls	42° 57'	77° 35'		X		
Hornell Almond Dam	42° 21'	77° 42'		X	X	
Jamestown Fire Sta. 4	42° 07'	79° 10'	X	X	X	X
Linden	42° 52'	78° 10'		X		

Station (N. Y. unless noted)	West Latitude	North Longitude	Temp.	Non-Recording Precip.	Recording Precip.	Snow-fall
Little Valley	42° 15'	78° 48'	X	X	X	X
Macedon	43° 04'	77° 18'		X		
Mount Morris 2W	42° 44'	77° 54'	X	X	X	X
Pavilion	42° 53'	78° 02'		X	X	
Portageville	42° 34'	78° 03'		X		
Prattsburg 2N.W.	42° 32'	77° 18'		X		X
Rochester WB Airport	43° 07'	77° 40'	X	X	X	X
Rushford 1W	42° 24'	78° 16'		X		
Salamanca	42° 10'	78° 41'			X	
Scio	42° 10'	77° 59'		X		
Sherman	42° 10'	79° 36'		X		
South Wales	42° 43'	78° 36'	X	X		
Stafford	42° 59'	78° 05'	X	X		
Troupsburg 4NE	42° 04'	77° 29'		X		
Wales	42° 44'	78° 31'				X
Warsaw 5SW	42° 41'	78° 12'	X	X		
Wellsville	42° 07'	77° 57'		X	X	
Westfield 2SW	42° 17'	79° 37'	X	X		X
West Jasper	42° 09'	77° 34'			X	
Whitesville	42° 02'	77° 46'		X		
Wiscoy	42° 30'	78° 05'	X	X		
Austinburg 2NW Pa.	42° 00'	77° 32'		X	X	
Raymond, Pa.	41° 52'	77° 52'	X	X		

3A. GAGING STATIONS

Partial records are available for 118 sites in the Genesee River basin, including stream stages, low flows, and lake and reservoir stages and contents. These sites are tabulated in table E2A. Of the 118 gages tabulated in table E2A, many were non-recording or had a short period of record, or both. Table E3A shows the major stations at which recording-gage data are available, along with the period of record for each gage. Presently there are in operation, in the Genesee basin, 19 recording stream gages, 5 of which have records longer than 50 years. Eight new stream gages were installed in the Genesee River basin in 1964. These gages are located at the following sites:

Dyke Creek near Andover, N. Y.
Van Campen Creek at Friendship, N. Y.
Angelica Creek at Transit Bridge, N. Y.
Genesee River at Belfast, N. Y.
East Koy Creek at East Koy, N. Y.
Canaseraga Creek at Canaseraga, N. Y.
Springwater Creek at Springwater, N. Y.
Oatka Creek at Warsaw, N. Y.

While data from these sites are not extensive as yet, they will be useful in the future for hydrologic studies. Tables E4A thru E22A present a summary of the records for pertinent sites in the Genesee River basin.

TABLE E2A-Downstream order list of measuring sites in the Genesee River basin (all stations in New York except as noted).

NOTE: GS= gaging station; PR= partial-record station; Misc= miscellaneous site; CS= crest stage, LF= low flow; Res= reservoir; D= discontinued

Station number	Remarks	Genesee River
2203	Misc	Genesee River at Hickox, Pa.
2203.1	Misc	Middle Branch Genesee River at Hickox, Pa.
2203.4	Misc	West Branch Genesee River at Genesee, Pa.
2203.5	Misc	Genesee River at Genesee, Pa.
2203.7	PR,LF	Cryder Creek at Paynesville
2203.88	Misc	Marsh Creek at Stone Dam
2203.89	Misc	Marsh Creek Tributary at Mapes
2203.9	PR,LF	Marsh Creek at Mapes
2204.1	PR,LF	Ford Brook at Stannard
2204.3	PR,LF	Chenunda Creek at Stannards Corners
2204.5	PR,LF-CS	Dyke Creek near West Greenwood
2204.55	PR,LF-CS	Quig Hollow Brook near Andover
		Railroad Brook:
		Marsh Creek:
2204.6	PR,LF-CS	Marsh Creek Tributary near Andover
2204.65	PR,LF-CS	Railroad Brook near Alfred
2204.7	GS	Dyke Creek near Andover
2204.8	PR,LF-CS	Elm Valley Creek near Elm Valley
2205	GS-D;PR,LF-CS	Dyke Creek at Wellsville
2210	GS-D	Genesee River at Wellsville
2212	PR,LF	Brimmer Brood near Wellsville
2215	GS	Genesee River at Scio
2215.1	PR,LF	Vandermark Creek near Scio
2215.2	PR,LF	Knight Creek at Scio
2215.3	Mics	Gordon Brook at Scio
2215.6	PR,LF	Phillips Creek near Belmont
2216	GS(was PR,LF)	Van Campen Creek at Frinedship
		Angelica Creek:
2216.5	PR,LF	Black Creek at Bennetts
2217	PR,LF	Angelica Creek near Angelica
2217.1	PR,LF	Baker Creek near Angelica
2217.2	GS	Angleica Creek at Trnasit Bridge
2217.6	PR,LF	White Creek near Belfast
2218	PR,LF	Black Creek at Rockville
2218.1	PR,LF	Wigwam Creek at Belfast
2218.2	GS	Genesee River at Belfast
2218.3	PR,LF	Crawford Creek at Oramel
2219	Misc	Caneadea Creek at Rushford
2219.4	Misc	Caneadea Creek Tributary at Rushford
2219.7	Misc	Rush Creek at McGranville
2219.9	Res	Rushford Lake
2220	GS	Caneadea Creek at Caneadea
		Cold Creek
		Sixtown Creek:
2225	GS-D	Lost Nation Brook near Centerville

TABLE E2A Downstream order list of measuring sites in the Genesee River basin (Cont'd.)

Station number	Remarks	Genesee River
2225.15	Misc	Sixtown Creek at Hume
2225.3	PR,LF	Cold Creek at Hume
2225.35	Misc	Rush Creek near Fillmore
2225.4	PR,LF	Rush Creek at Fillmore
2226	PR,LF-CS	Wiscoy Creek at Bliss
2226.8	PR,LF	Trout Brook at Pike Corners
2227	PR,LF	Wiscoy Creek at Pike
2229	GS	East Koy Creek at East Koy
2229.3	Misc	Wiscoy Creek at Rossburg
2230	GS	Genesee River at Portageville
2234	PR,LF	Wolf Creek near Castile
2235	GS-D	Genesee River at St. Helena
2239	Res	Silver Lake
2239.5	Misc	Silver Lake Outlet near Ridge
2240	GS, Res	Mt. Morris Reservoir near Mount Morris
2245	GS-D	Genesee River at Mount Morris
		Canaserage Creek:
2245.5	PR,LF-CS	Ewart Creek at Swain
2246.5	GS	Canaweraga Creek near Canaseraga
2247	PR,LF-CS	Sugar Creek near Ossian
2247.5	Misc	Sugar Creek near Moraine
2248	PR,LF-CS	Stony Brook at South Dansville
2248.1	PR,LF-CS	Sponable Creek near South Dansville
2248.5	Misc	Stony Brook near Stony Brook Glen
2249	PR,LF-CS	Mill Creek at Patchinville
2249.8	Misc	Mill Creek at Dansville
2250	GS	Canaseraga Creek near Dansville
2255	GS	Canaseraga Creek at Groveland
2256	PR,LF	Bradner Creek at Woodsville
		Keshequa Creek:
2259	Misc	Newville Creek near Barkertown
2260	GS-D;PR,LF	Keshequa Creek at Craig Colony, Sonyea
2265	GS-D	Keshequa Creek near Sonyea
2270	GS	Canaseraga Creek at Shakers Crossing
2275	GS	Genesee River at Jones Bridge near Mount Morris
2276	PR,LF	Beards Creek at Cuylerville
2276.5	PR,LF	Jaycox Creek near Geneseo
2279	PR,LF	Christie Creek near Canawaugus
2279.8	GS, Res	Conesus Lake near Lakeville
2279.9	Misc	Wilkins Creek at Tuxedo Park
2279.95	Misc	Conesus Creek at Lakeville
2280	GS-D	Conesus Creek near Lakeville
2283	Misc	Conesus Creek at Ashantee
2285	GS	Genesee River at Avon
2285.2	PR,LF	White Creek at Canawaugus
2285.5	PR,LF	Dugan Creek at Maxwell
2288.45	GS	Honeoye Lake near Honeoye

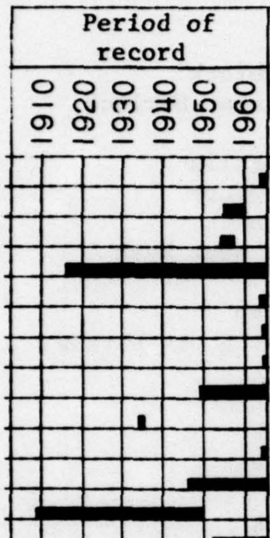
TABLE E2A Downstream order list of measuring sites in the Genesee River basin (Cont'd.)

Station number	Remarks	Genesee River
2288.5	Res	Honeoye Lake at OUtlet
		Honeoye Creek:
2288.55	PR,LF	Mill Creek at Honeoye Park
2289	GS	Springwater Creek at Springwater
2289.2	Res	Hemlock Lake at Outlet
		Hemlock Lake Outlet:
2289.5	GS,Res	Canadice Lake near Hemlock
2290	GS	Canadice Lake Outlet near Hemlock
2293.3	Misc	Bebee Creek at Idaho
2295	GS	Honeoye Creek at Honeoye Falls
2297	PR,LF	Spring Brook at Moran Corner
2300	GS-D	Honeoye Creek at East Rush
2300.5	PR,LF	Honeoye Creek Tributary near Rush
		Oatka Creek:
2303.1	PR,LF	Warner Creek at Rock Glen
2303.5	Misc	Oatka Creek Tributary at South Warsaw
2303.6	PR,LF	Stony Creek at Warsaw
2303.8	GS	Oatka Creek at Warsaw
2304	PR,CS	Oatka Creek at Pearl Creek
2304.1	PR,LF	Pearl Creek at Pearl Creek
2304.3	Misc	Oatka Creek near Roanoke
2304.8	Misc	Oatka Creek near Lime Rock
2304.9	PR,LF-CS	Spring Creek at Mumford
2305	GS	Oatka Creek at Garbutt
2306	Misc	Genesee River at Ballantyne Bridge near Mortimer
		Black Creek:
2307	Misc	Bigelow Creek near South Byron
2308	PR,LF	Spring Creek at Pumpkin Hill
2310	GS	Black Creek at Churchville
2310.5	PR,LF	Hotel Creek near Churchville
2311	PR,LF	Mill Creek near West Chili
2312	Misc	Black Creek near Genesee Junction
(2186.5)	Misc	Erie (Barge) Canal near Gates Center
2314	PR,LF	Red Creek near Rochester
(2188)	Misc	Erie (Barge) Canal at West Brighton
2315	GS-D	Genesee River at Rochester
2320	GS	Genesee River at Driving Park Ave., Rochester

TABLE E3A - Length of gaging-station records in the Genesee River basin (stations listed in downstream order)

Legend

Streamflow   Reservoir contents   Stage



Gaging station	Station number
Dyke Creek near Andover........................	4-2204.7
Dyke Creek at Wellsville.......................	4-2205
Genesee River at Wellsville....................	4-2210
Genesee River at Scio..........................	4-2215
Van Campen Creek at Friendship.................	4-2216
Angelica Creek at Transit Bridge...............	4-2217.2
Genesee River at Belfast.......................	4-2218.2
Caneadea Creek at Caneadea.....................	4-2220
Lost Nation Brook near Centerville.............	4-2225
East Koy Creek at East Koy.....................	4-2229
Genesee River at Portageville..................	4-2230
Genesee River at St. Helena....................	4-2235
Mt. Morris Reservoir near Mt. Morris...........	4-2240
Genesee River at Mt. Morris....................	4-2245
Canaseraga Creek near Canaseraga...............	4-2246.5
Canaseraga Creek near Dansville................	4-2250
Canaseraga Creek at Groveland..................	4-2255
Keshequa Creek at Craig Colony, Sonyea.........	4-2260
Keshequa Creek near Sonyea.....................	4-2265
Canaseraga Creek at Shakers Crossing...........	4-2270
Genesee River at Jones Bridge near Mt. Morris..	4-2275
Conesus Lake near Lakeville....................	4-2279.8
Conesus Creek near Lakeville...................	4-2280
Genesee River at Avon..........................	4-2285
Honeoye Lake near Honeoye......................	4-2288.45
Springwater Creek at Springwater...............	4-2289
Canadice Lake near Hemlock.....................	4-2289.5
Canadice Lake Outlet near Hemlock..............	4-2290
Honeoye Creek at Honeoye Falls.................	4-2295
Honeoye Creek at East Rush.....................	4-2300
Oatka Creek at Warsaw..........................	4-2303.8
Oatka Creek at Garbutt.........................	4-2305
Black Creek at Churchville.....................	4-2310
Genesee River Rochester........................	4-2315
Genesee River at Driving Park Ave., Rochester..	4-2320

TABLE E4A

4-2215. Genesee River at Scio, N. Y.

Location.--Lat 42°09'50", long 77°58'50", on left bank 0.4 mile upstream from Vandermark Creek and three-quarters of a mile upstream from Scio, Allegany County.

Drainage area.--309 sq mi.

Records available.--June 1916 to September 1963.

Gage.--Water-stage recorder. Datum of gage is 1,438.83 ft above mean sea level, datum of 1929. Prior to Aug. 11, 1938, staff gage and Aug. 11 to Oct. 11, 1938, water-stage recorder, at same site at datum 1.0 ft higher.

Average discharge.--47 years (1916-63), 385 cfs.

Extremes.--1916-63: Maximum discharge, 23,300 cfs (revised) Nov. 25, 1950 (gage height, 11.22 ft); minimum, 5.8 cfs Sept. 4, 1939; minimum gage height, 0.02 ft Sept. 2, 1962.

Remarks.--Chemical analyses of water collected at this site during water year 1955 are published in WSP 1400, and are summarized on page 41 of this report.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1916	434	--	--	--	--	--
1917	454	a/ 5,020	Mar. 12, 1917	26	415	268
1918	474	b/13,100	Mar. 14, 1918	34	529	342
1919	504	b/13,900	May 22, 1919	27	437	282
1920	504	8,810	Mar. 12, 1920	25	319	206
1921	524	3,810	Feb. 17, 1921	21	274	177
1922	544	4,230	June 12, 1922	34	401	259
1923	564	6,010	Mar. 4, 1923	17	271	175
1924	584	8,320	Sept. 30, 1924	20	370	239
1925	604	8,140	Feb. 11, 1925	16	303	196

a/ Corrected; this corrected figure also shown in WSP 1307.
b/ Revision of previously published figure.

TABLE E4A

4-2215. Genesee River at Scio, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1926	624	3,530	Mar. 23, 1926	23	317	205
1927	644	6,090	Mar. 21, 1927	16	445	288
1928	664	7,600	Dec. 1, 1927	17	602	389
1929	684	6,800	Apr. 21, 1929	20	475	307
1930	699	4,710	Feb. 25, 1930	17	366	237
1931	714	3,020	May 24, 1931	18	256	165
1932	729	3,970	Feb. 11, 1932	13	337	218
1933	744	3,410	Apr. 7, 1933	17	276	178
1934	759	4,710	Mar. 27, 1934	18	248	160
1935	784	8,560	July 8, 1935	28	400	259
1936	804	b/ 8,550	Mar. 12, 1936	19	406	262
1937	824	6,640	Jan. 25, 1937	23	441	285
1938	854	7,120	Mar. 6, 1938	19	349	226
1939	874	7,180	Feb. 20, 1939	6.9	286	185
1940	894	8,530	Mar. 31, 1940	24	395	255
1941	924	7,200	Apr. 5, 1941	15	258	167
1942	954	b/11,200	July 18, 1942	16	403	260
1943	974	8,290	Dec. 30, 1942	20	554	358
1944	1004	4,810	Mar. 17, 1944	16	285	184
1945	1034	8,390	May 18, 1945	29	536	346
1946	1054	b/17,900	May 28, 1946	64	511	330
1947	1084	b/10,800	Apr. 5, 1947	59	508	328
1948	1114	b/13,300	Mar. 22, 1948	16	384	248
1949	1144	2,690	Jan. 6, 1949	10	273	176
1950	1174	b/13,900	Mar. 28, 1950	19	367	237
1951	1207	b/23,300	Nov. 25, 1950	28	577	373
1952	1237	b/ 7,500	Mar. 11, 1952	21	479	310
1953	1277	b/ 8,750	Mar. 24, 1953	24	345	223
1954	1337	5,360	Mar. 2, 1954	16	318	206
1955	1387	b/ 6,730	Mar. 1, 1955	15	246	159

b/ Revision of previously published figure.

TABLE E4A

4-2215. Genesee River at Scio, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1956	1437	16,900	Mar. 8, 1956	26	597	386
1957	1507	8,240	Jan. 23, 1957	20	412	266
1958	1557	7,950	Apr. 7, 1958	24	395	255
1959	1627	19,500	Jan. 22, 1959	12	390	252
1960	1707	12,800	June 15, 1960	22	493	318
1961	S.R.	14,400	Feb. 26, 1961	16	327	211
1962	S.R.	3,590	Apr. 7, 1962	12	227	147
1963	S.R.	6,990	Mar. 27, 1963	25	281	182

TABLE E5A

4-2220. Caneadea Creek at Caneadea, N. Y.

Location.--Lat 42°23'10", long 78°09'45", on left bank at Caneadea, Allegany County, 800 ft upstream from unnamed tributary and 0.6 mile upstream from mouth.

Drainage area.--61.5 sq mi.

Records available.--July 1949 to September 1963.

Gage.--Water-stage recorder. Datum of gage is 1,240.42 ft above mean sea level, datum of 1929, adjustment of 1943.

Average discharge.--14 years (1949-63), 87.3 cfs (adjusted for storage).

Extremes.--1949-63: Maximum discharge, 9,600 cfs June 15, 1960 (gage height, 10.74 ft), from rating curve extended above 770 cfs on basis of hydraulic study of flow over Rushford Dam; minimum, 0.7 cfs Nov. 11, 13, 1954; minimum daily, 0.8 cfs Feb. 3, 1961: minimum gage height, 1.35 ft Dec. 9, 1961.

Remarks.--Considerable regulation by Rushford Lake (capacity, 1,106,000,000 cu ft) about 2 miles above station.

TABLE E5A

4-2220. Caneadea Creek at Caneadea, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	*Adjusted mean (cfs)	*Adjusted mean (mgd)
1949	1144	--		--	--	--	--
1950	1174	1,570	Apr. 5, 1950	1.0	69.1	a/ 89.4	57.8
1951	1207	1,590	Sept. 25, 1951	2.4	111	99.2	64.1
1952	1237	1,110	Feb. 29, 1952	1.5	98.5	105	67.8
1953	1277	1,180	Sept. 14, 1953	1.2	92.7	74.6	48.2
1954	1337	1,600	Apr. 28, 1954	1.4	58.6	70.9	45.8
1955	1387	548	Dec. 17, 1954	.9	44.6	55.7	36.0
1956	1437	1,700	Oct. 15, 1955	1.0	136	136	87.9
1957	1507	1,090	May 20, 1957	2.2	90.3	90.1	58.2
1958	1557	971	Sept. 15, 1958	2.3	88.5	74.9	48.4
1959	1627	1,130	Feb. 20, 1959	1.9	93.5	87.6	56.6
1960	1707	9,600	June 15, 1960	1.4	118	123	79.5
1961	S.R.	8,690	Apr. 25, 1961	.8	83.4	83.5	54.0
1962	S.R.	796	Dec. 13, 1961	2.0	45.8	57.6	37.2
1963	S.R.	1,200	Mar. 27, 1963	.9	74.3	74.3	48.0

a/ Previously published only in WSP 1307.
* Adjusted for change in contents in Rushford Lake.

TABLE E6A

4-2230. Genesee River at Portageville, N. Y.

Location.--Lat 42°34'10", long 78°02'45", on left bank at Portageville, Wyoming County, 300 ft downstream from small tributary, 350 ft downstream from Pennsylvania Railroad bridge, and 0.7 mile upstream from Upper Falls.

Drainage area.--982 sq mi. Prior to Oct. 1, 1946, 1,017 sq mi.

Records available.--August 1908 to September 1963. Prior to December 1945 published as "at St. Helena". Records published for both sites December 1945 to September 1950.

TABLE E6A

4-2230. Genesee River at Portageville, N. Y. (Continued)

Gage.--Water-stage recorder since Oct. 1, 1946, Datum of gage is 1,082.60 ft above mean sea level (levels by Corps of Engineers) Prior to Aug. 24, 1911, chain gage and Aug. 24, 1911, to Sept. 30, 1946, water stage recorder, at site 8 miles downstream at different datum. Both recorders in operation Dec. 16, 1945, to Sept. 30, 1950.

Average discharge.--55 years (1908-63), 1,218 cfs (unadjusted).

Extremes.--1908-63: Maximum discharge, 44,400 cfs May 17, 1916 (gage height, 12.81 ft, site and datum then in use); maximum gage height, 21,70 ft Mar. 7, 1956; minimum discharge, 18 cfs Oct. 5, 17, 1913 (gage height, 1.70 ft, site and datum then in use).

Remarks.--Some seasonal regulation by Rushford Lake (capacity, 1,106,000,000 cu ft) since July 1928. Diurnal fluctuation at low flow caused by powerplants.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Adjusted mean (cfs)	Adjusted mean (mgd)
1908	264	--		--	--	--	--
1909	264	26,300	Apr. 30, 1909	59	1,060	--	--
1910	284	30,200	Feb. 28, 1910	64	1,170	--	--
1911	304	12,600	Aug. 28, 1911	61	1,190	--	--
1912	324	22,700	Mar. 30, 1912	64	1,340	--	--
1913	354	42,800	Mar. 26, 1913	--	1,450	--	--
1914	384	23,000	Mar. 28, 1914	20	1,230	--	--
1915	404	21,400	Feb. 15, 1915	61	1,150	--	--
1916	434	44,400	May 17, 1916	77	2,040	--	--
1917	454	16,700	Mar. 12, 1917	81	1,340	--	--
1918	474	29,500	Mar. 14, 1918	91	1,280	--	--
1919	504	32,800	May 22, 1919	78	1,240	--	--
1920	504	39,700	Mar. 13, 1920	56	920	--	--
1921	524	18,100	Feb. 17, 1921	37	909	--	--
1922	544	12,600	Mar. 7, 1922	127	1,250	--	--
1923	564	16,400	Mar. 16, 1923	50	814		
1924	584	17,600	Sept. 30, 1924	65	1,220	--	--
1925	604	17,500	Feb. 12, 1925	86	910	--	--

TABLE E6A

4-2230. Genesee River at Portageville, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	*Adjusted mean (cfs)	*Adjusted mean (mgd)
1926	624	14,800	Mar. 25, 1926	88	1,190	--	--
1927	644	15,800	May 24, 1927	70	1,410	--	--
1928	664	42,700	Dec. 1, 1927	72	1,660	--	--
1929	684	26,700	Apr. 21, 1929	71	1,490	--	--
1930	699	20,500	Feb. 26, 1930	65	1,200	--	--
1931	714	11,600	May 24, 1931	52	789	--	--
1932	729	14,200	Feb. 11, 1932	47	1,220	--	--
1933	744	17,200	Mar. 14, 1933	65	960	--	--
1934	759	15,200	Mar. 4, 1934	28	782	--	--
1935	784	17,400	July 9, 1935	75	1,172	--	--
1936	804	25,500	Mar. 26, 1936	36	1,148	--	--
1937	824	18,100	Jan. 25, 1937	58	1,363	--	--
1938	854	17,200	Mar. 6, 1938	80	1,052	--	--
1939	874	28,400	Feb. 20, 1939	32	1,094	--	--
1940	894	26,500	Apr. 5, 1940	77	1,336	--	--
1941	924	29,400	Apr. 6, 1941	72	1,044	--	--
1942	954	32,300	Mar. 17, 1942	86	1,183	--	--
1943	974	27,400	May 26, 1943	108	1,800	--	--
1944	1004	15,200	Mar. 17, 1944	83	969	--	--
1945	1034	24,600	Mar. 4, 1945	125	1,536	--	--
1946	1054	25,200	May 28, 1946	176	1,460	--	--
1947	1084	28,300	Apr. 6, 1947	156	1,619	--	--
1948	1114	24,100	Mar. 22, 1948	83	1,187	--	--
1949	1144	9,660	Jan. 6, 1949	73	882	--	--
1950	1174	31,900	Mar. 29, 1950	80	1,141	--	--
1951	1207	31,900	Nov. 26, 1950	82	1,679	a/1,667	1,080
1952	1237	23,200	Mar. 12, 1952	55	1,347	1,354	875
1953	1277	21,000	Mar. 24, 1953	86	1,140	1,122	725
1954	1337	15,400	Apr. 28, 1954	63	1,023	1,036	669
1955	1387	20,700	Mar. 1, 1953	48	799	810	524

a/ Previously published only in WSP 1727.
* Adjusted for change in contents in Rushford Lake.

TABLE E6A

4-2230. Genesee River at Portageville, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	*Adjusted mean (cfs)	*Adjusted mean (mgd)
1956	1437	36,100	Mar. 7, 1956	63	1,849	1,849	1,190
1957	1507	19,700	Apr. 6, 1957	76	1,289	1,288	832
1958	1557	19,300	Apr. 6, 1958	62	1,077	1,063	687
1959	1627	33,300	Jan. 22, 1959	60	1,250	1,244	804
1960	1707	27,800	Mar. 31, 1960	70	1,637	1,642	1,060
1961	S.R.	30,200	Apr. 25, 1961	66	1,147	1,147	741
1962	S.R.	12,000	Apr. 7, 1962	37	766	778	503
1963	S.R.	24,500	Mar. 27, 1963	88	790	790	511

TABLE E7A

4-2240. Mount Morris Reservoir near Mount Morris, N. Y.

Location.--Lat 42°44'00", long 77°54'40", at Mount Morris Dam on Genesee River, 2-1/2 miles northwest of Mount Morris, Livingston County, 5 miles upstream from Canaseraga Creek, and 40 miles upstream from mouth.

Drainage area.--1,077 sq mi (measured by Corps of Engineers).

Records available.--January 1952 to September 1963.

Gage.--Water-stage recorder. Datum of gage is at mean sea level (levels by Corps of Engineers). Prior to Apr. 8, 1952, reference point at same site and datum.

Extremes.--1952-63: Maximum elevation, 719.4 ft Apr. 5, 1960 (contents, 215,980 acre-ft); minimum, 585.1 ft Dec. 13-15, 24, 25, 1960, Jan. 22 to Feb. 12, 1961 (contents, 626 acre-ft).

Remarks.--Reservoir is formed by a concrete gravity-type dam with overflow spillway, completed by Corps of Engineers in 1951 for flood control; first used for flood regulation on Nov. 24, 1951. Usable capacity, 337,000 acre-ft between elevations 585.0 ft (sill of conduits) and 760.0 ft (crest of spillway). Dead storage, 609 acre-ft. Floods are controlled by the operation of nine gates. Water is stored during high flows and released when downstream conditions warrant.

TABLE E7A

4-2240. Mount Morris Reservoir near Mount Morris, N. Y. (Continued)

Cooperation.--Capacity table furnished by Corps of Engineers.

Numbers of water-supply papers containing daily elevations, contents, and changes in contents

Year	WSP	Year	WSP	Year	WSP
1952	1277	1955	1387	1958	1557
1953	1277	1956	1437	1959	1627
1954	1337	1957	1507	1960	1707

Note: Comparable data for each water year since 1960 are contained in annual open-file reports, "Surface water records of New York".

TABLE E8A

4-2245. Genesee River at Mount Morris, N. Y.

Location.--Lat 42 44'20", long 77 52'55", at dam of Mount Morris Water Power Co. in Mount Morris, Livingston County, about 2 miles upstream from Canaseraga Creek.

Drainage area.--1,078 sq mi (revised).

Gage.--Staff gage. Altitude of gage is 570 ft (from topographic map).

Remarks.--Discharge over dam and wasteways and through wheels in powerplant computed by formula and wheel ratings. Diversion through mills determined at gaging station on tailrace below mills. Leakage from wasteway at head of canal and through banks, estimated as varying between 6 cfs and 40 cfs, not included in estimates of total discharge.

Records for the period September 1893 to November 1896, published in the Twentieth Annual Report, Part 4[a], have not been included herein because base data were not available for evaluation of them.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1905	244	--	--	--	--	--
1906	244	--	--	116	1,030	666

TABLE E8A

4-2245. Genesee River at Mount Morris, N. Y. (Continued)

Water year	WSP no.	Momentary maximum Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	(mgd)
1907	244	--	--	82	1,450	937
1908	244	--	--	99	1,650	1,070
1909	264	--	--	--	--	--

a/ Twentieth Annual Report of the U. S. Geological Survey, 1898-99, published in 1899.

TABLE E9A

4-2250. Canaseraga Creek near Dansville, N. Y.

Location.--Lat 42 33'40", long 77 42'55", on left bank just downstream from Ossian Street Bridge, half a mile downstraam from Mill Creek and 1 mile west of Dansville, Livingston County.

Drainage area.--153 sq mi. October 1917 to September 1919, October 1938 to September 1940, 155 sq mi.

Records available.--July 1910 to December 1912, July 1915 to June 1917, October 1917 to September 1919 (published as "at Cumminsville"), March 1920 to September 1963. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 640.00 ft above mean sea level (levels by New York State Conservation Commission). Prior to Oct. 19, 1920, staff gage at or within 1 mile of present site at various datums. Oct. 19, 1920, to Sept. 30, 1938, water-stage recorder at present site and datum, and Oct. 1, 1938, to Oct. 8, 1940, at site 0.9 mile downstream at datum 15.70 ft lower.

TABLE E9A

4-2250. Canaseraga Creek near Dansville, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1936	804	4,240	Mar. 25, 1936	18	166	107
1937	824	2,830	June 21, 1937	17	145	93.7
1938	854	4,420	Mar. 5, 1938	16	123	79.5
1939	874	4,860	Feb. 20, 1939	16	149	96.3
1940	894	9,110	July 23, 1940	20	158	102
1941	924	5,860	Apr. 5, 1941	11	133	85.9
1942	954	8,400	Mar. 17, 1942	14	148	95.6
1943	974	7,560	May 26, 1943	25	211	136
1944	1004	4,490	Mar. 16, 1944	21	121	78.2
1945	1034	6,370	May 17, 1945	24	204	132
1946	1054	4,260	June 1, 1946	26	163	105
1947	1084	4,910	Apr. 5, 1947	32	218	141
1948	1114	6,350	Mar. 19, 1948	19	135	87.2
1949	1144	1,680	Feb. 14, 1949	16	93.8	60.6
1950	1174	7,170	Mar. 28, 1950	18	137	88.5
1951	1207	6,150	Mar. 30, 1951	21	220	142
1952	1237	3,630	Mar. 11, 1952	18	154	99.5
1953	1277	3,790	Mar. 24, 1953	24	141	91.1
1954	1337	5,240	Apr. 27, 1954	20	123	79.5
1955	1387	3,990	Mar. 1, 1955	14	100	64.6
1956	1437	4,500	Mar. 7, 1956	18	222	143
1957	1507	2,970	Apr. 6, 1957	21	161	104
1958	1557	2,910	Apr. 6, 1958	18	121	78.2
1959	1627	6,000	Jan. 22, 1959	18	147	94.9
1960	1707	5,170	Mar. 30, 1960	20	215	139
1961	S.R.	8,230	Apr. 25, 1961	15	147	95.0
1962	S.R.	1,570	Mar. 12, 1962	12	104	67.2
1963	S.R.	2,770	Mar. 17, 1963	18	112	72.4

TABLE E9A

4-2250. Canaseraga Creek near Dansville, N. Y. (Continued)

Average discharge.--48 years (1910-12, 1915-16, 1917-19, 1920-63), 152 cfs.

Extremes.--1910-12, 1915-63: Maximum discharge at present site, 8,830 cfs July 23, 1940 (gage height, 13.1 ft, from floodmark); maximum gage height at present site, 13,68 ft Mar. 7, 1956; maximum discharge at former site, 9,110 cfs July 23, 1940 (gage height, 9.93 ft), from rating curve extended above 2,100 cfs on basis of slope-area measurement of peak flow; minimum daily, 3 cfs Apr. 28, 1912.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1910	324	--	--	--	--	--
1911	324	a/ 1,880	Mar. 27, 1911	a/ 10	a/135	87.2
1912	324	a/ 4,900	July 9, 1912	3	a/185	120
1913	324	--	--	--	--	--
1915	404	--	--	--	--	--
1916	434	6,600	May 16, 1916	a/32	a/277	179
1917	454	2,380	June 11, 1917	--	--	--
1918	504	3,790	Feb. 12, 1918	21	a/162	105
1919	504	6,540	May 22, 1919	21	141	91.1
1920	504	3,950	July 24, 1920	--	--	--
1921	524	1,270	Mar. 9, 1921	16	109	70.4
1922	544	3,500	Sept. 4, 1922	23	164	106
1923	604	3,570	Mar. 4, 1923	17	127	82.1
1924	604	1,830	Sept. 30, 1924	19	137	88.5
1925	604	3,240	Feb. 11, 1925	22	112	72.4
1926	624	2,100	Apr. 8, 1926	19	138	89.2
1927	644	2,600	May 24, 1927	29	171	111
1928	664	6,900	Nov. 30, 1927	19	227	147
1929	684	6,150	Apr. 21, 1929	18	198	128
1930	699	1,850	Mar. 17, 1930	15	151	97.6
1931	714	2,400	May 13, 1931	13	100	64.6
1932	729	3,350	May 9, 1932	16	138	89.2
1933	744	3,160	Mar. 14, 1933	16	110	71.1
1934	759	--	--	12	84.8	54.8
1935	784,894	8,390	July 8, 1935	14	149	96.3

a/ Previously published only in WSP 1307.

TABLE E10A

4-2255. Canaseraga Creek at Groveland, N. Y.

Location.--Lat 42°39'45", long 77°46'10", on left bank at downstream side of highway bridge at Groveland, Livingston County, 0.2 mile downstream from small tributary.

Drainage area.--181 sq mi.

Records available.--August 1915 to September 1916 (gage heights and discharge measurements only) and February 1917 to March 1920 (no winter records in 1917, 1918, 1920), published as "at Groveland Station"; October 1955 to September 1963.

Gage.--Water-stage recorder. Datum of gage is 565.42 ft above mean sea level (levels by Corps of Engineers). Prior to Mar. 30, 1916, inclined staff gage at site 400 ft upstream at datum about 5.42 ft lower. Mar. 30, 1916, to Mar. 31, 1920, chain gage on downstream side of bridge at practically same datum as inclined staff gage.

Average discharge.--9 years (1918-19, 1955-63), 181 cfs.

Extremes.--1917-20, 1955-63: Maximum discharge observed, 4,380 cfs May 22, 1919 (gage height, 18.05 ft); minimum, 15 cfs Sept. 9, 1962; minimum gage height, 1.96 ft Oct. 2, 5, 1955.

Remarks.--Overflow of left bank occurs upstream at extremely high stages. Water returns to channel below station. Chemical analyses of water collected at this site during water year 1961 will be published in WSP 1882, and are summarized on page 41 of this report.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1917	454	4,170	July 29, 1917	--	--	--
1918	474	--	--	--	--	--
1919	504	4,380	May 22, 1919	25	173	112
1920	504	--	--	--	--	--
1956	1437	3,380	Mar. 7, 1956	18	258	167
1957	1507	2,810	Apr. 6, 1957	23	202	131
1958	1557	2,880	Apr. 6, 1958	21	141	91.1
1959	1627	2,610	Apr. 2, 1959	22	175	113
1960	1707	3,800	Mar. 30, 1960	27	244	158

TABLE E10A

4-2255. Canaseraga Creek at Groveland, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	(mgd)
1961	S.R.	3,330	Apr. 25, 1961	17	179	116
1962	S.R.	2,020	Mar. 12, 1962	15	125	80.8
1963	S.R.	2,980	Mar. 17, 1963	22	134	86.6

TABLE E11A

4-2260. Keshequa Creek at Craig Colony, Sonyea, N. Y.

Location.--Lat 42 40'55", long 77 49'45", on right bank 200 ft downstream from private bridge on grounds of Craig Colony at Sonyea, Livingston County, about 2 miles upstream from mouth.

Drainage area.--69.1 sq mi. September 1915 to October 1917, 76.5 sq mi.

Gage.--Staff gage. Altitude of gage is 600 ft (from topographic map). Prior to Dec. 31, 1912, staff or chain gage at highway bridge 200 ft upstream at different datum; Aug. 29, 1915, to Oct. 31, 1917, staff gage at site about 1 mile downstream near Delaware, Lackawanna and Western Railroad bridge at different datum.

Average discharge.--15 years (1917-32), 49.7 cfs.

Extremes.--1911-12, 1917-32: Maximum discharge, 5,940 cfs Mar. 14, 1918, May 22, 1919; minimum, about 0.1 cfs Sept. 8-21, 1932.

Year summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	(mgd)
1911	304,324	--	--	--	--	--
1912	324	--	--	--	--	--
1913	324	--	--	--	--	--

TABLE E11A

4-2260. Keshequa Creek at Craig Colony, Sonyea, N. Y. (Continued)

Year summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1915	404	--	--	--	--	--
1916	434	--	--	--	--	--
1917	454	--	--	--	--	--
1918	474	a/ 5,940	Mar. 14, 1918	0.8	58.6	37.9
1919	504	5,940	May 22, 1919	1.8	43.0	27.8
1920	504	3,310	Mar. 12, 1920	1.0	35.3	22.8
1921	524	1,410	Feb. 16, 1921	1.3	39.1	25.3
1922	544	1,840	Mar. 7, 1922	3.2	52.1	33.7
1923	564	1,780	Mar. 3, 1923	.9	35.5	22.9
1924	584	2,500	May 12, 1924	1.5	50.0	32.3
1925	604	2,000	Feb. 11, 1925	1.1	36.3	23.5
1926	624	2,160	Apr. 8, 1926	1.3	46.8	30.2
1927	644	1,990	May 9, 1927	1.5	54.7	35.4
1928	664	b/ 5,640	Nov. 17, 1927	1.8	86.8	56.1
1929	684	2,200	Apr. 21, 1929	.8	66.8	43.2
1930	699	2,330	Jan. 14, 1930	.2	54.8	35.4
1931	714	5,500	May 12, 1931	.9	33.9	21.9
1932	729	3,110	May 9, 1932	.1	51.8	33.5

a/ Corrected; this corrected figure also shown in WSP 1307.
b/ Previously published only in WSP 1307.

TABLE E12A

4-2270. Canaseraga Creek at Shakers Crossing, N. Y.

Location.--Lat 42°44'15", long 77°50'30", on left bank at upstream side of highway bridge at Shakers Crossing, about 1 mile upstream from mouth and 1-1/2 miles northeast of Mount Morris, Livingston County.

Drainage area.--333 sq mi.

Records available.--July 1915 to September 1922 (gage heights only), November 1958 to September 1963.

Gage.--Water-stage recorder. Datum of gage is 545.30 ft above mean sea level (levels by Corps of Engineers). Prior to November 1958, at site 40 ft downstream at datum 5.30 ft lower.

Extremes.--1959-63: Maximum discharge, 4,430 cfs Apr. 26,1961 (gage height, 12.07 ft); minimum, 16 cfs Sept. 9, 1962; minimum gage height, 2.65 ft Sept. 1, 2, 1962.

1915-22: Maximum gage height, 23.62 ft (present datum) May 17, 1916 (backwater from Genesee River).

Yearly summary of stream discharge

Water year ending Sept. 30

Water Year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1959	1627	2,900	Apr. 2,1959	--	--	--
1960	1707	4,350	Apr. 1,1960	25	400	259
1961	S.R.	4,430	Apr. 26,1961	20	304	196
1962	S.R.	1,600	Apr. 7,1962	17	179	116
1963	S.R.	3,170	Mar. 18,1963	25	211	136

TABLE E13A

4-2275. Genesee River at Jones Bridge, near Mount Morris, N. Y.

Location.--Lat 42°45'55", long 77°50'25", on right bank at Jones Bridge, 1-1/2 miles downstream from Canaseraga Creek and 3-1/2 miles northeast of Mount Morris, Livingston County.

Drainage area.--1,419 sq mi.

Records available.--May 1903 to April 1906, August 1908 to April 1914, July 1915 to September 1963.

TABLE E13A

4-2275. Genesee River at Jones Bridge, near Mount Morris, N. Y. (Continued)

Gage.--Water-Stage recorder. Datum of gage is 540.00 ft above mean sea level (levels by New York State Conservation Commission). Prior to Sept. 11, 1915, chain gage on bridge at datum 2.73 ft lower.

Average discharge.--53 years (1908-13, 1915-63), 1,600 cfs (unadjusted).

Extremes.--1903-6, 1908-14, 1915-63: Maximum discharge, 55,100 cfs May 17, 1916 (gage height, 25.44 ft); minimum, 12 cfs July 23, 1955 (gage height, 0.22 ft, partially obstructed intake); minimum daily, 30 cfs Aug. 8, 1909.

Remarks.--Diurnal fluctuation at low flow caused by powerplants. Flow regulated to some extent by Rushford Lake (capacity, 1,106,000 cu ft) since July 1928 and, at high flows, since November 1951 by Mount Morris Reservoir (see p. 15). Chemical analyses of water collected near this site during water years 1955 and 1956 are published in WSP 1400 and 1450, and are summarized on page 41 of this report.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP No.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Adjusted mean (cfs)	Adjusted mean (mgd)
1903	97	--	--	--	--	--	--
1904	129	--	--	--	--	--	--
1905	170	--	--	--	--	--	--
1906	206	--	--	--	--	--	--
1908	244	--	--	--	--	--	--
1909	264	a/24,000 May	2, 1909	30	1,440	--	--
1910	284	--	--	60	1,470	--	--
1911	304	--	--	80	1,500	--	--
1912	324	--	--	141	1,670	--	--
1913	354,1387	b/38,000 Mar.	26, 1913	58	b/1,900	--	--
1914	384	--	--	--	--	--	--
1915	404	--	--	--	--	--	--
1916	434	55,100 May	17, 1916	138	2,640	--	--
1917	454	31,800 Mar.	12, 1917	118	1,600	--	--
1918	474	a/29,000 Mar.	15, 1918	126	1,790	--	--
1919	504	32,000 May	23, 1919	187	c/1,630	--	--
1920	504	20,700 July	24, 1920	117	1,200	--	--

a/ Previously published only in Wsp 1307.
b/ Revised; this revised figure also shown in Wsp 1387 and 1707.
c/ Corrected; this corrected figure also shown in Wsp 1307.

TABLE E13A

4-2275. Genesee River at Jones Bridge, near Mount Morris, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water Year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	* Adjusted mean (cfs)	* Adjusted mean (mgd)
1921	524	17,900	Feb. 17, 1921	94	1,230	--	--
1922	544	14,600	Apr. 1, 1922	154	1,690	--	--
1923	564	12,200	Apr. 5, 1923	66	1,110	--	--
1924	584	20,100	Sept. 30, 1924	78	1,510	--	--
1925	604	a/26,600	Feb. 12, 1925	108	1,250	--	--
1926	624	14,500	Apr. 9, 1926	133	1,520	--	--
1927	644	16,600	May 24, 1927	58	1,840	--	--
1928	664	46,800	Dec. 1, 1927	130	2,320	--	--
1929	684	26,000	Apr. 21, 1929	137	2,020	--	--
1930	699	19,600	Feb. 26, 1930	38	1,620	--	--
1931	714	13,000	May 24, 1931	81	999	--	--
1932	729	16,000	May 10, 1932	73	1,560	--	--
1933	744	18,100	Mar. 15, 1933	108	1,240	--	--
1934	759	14,300	Mar. 5, 1934	36	972	--	--
1935	784	14,500	July 9, 1935	93	1,438	--	--
1936	804	26,300	Mar. 26, 1936	53	1,589	--	--
1937	824	18,000	Jan. 25, 1937	89	1,745	--	--
1938	854	18,000	Mar. 6, 1938	85	1,380	--	--
1939	874	25,500	Feb. 21, 1939	46	1,358	--	--
1940	894	29,600	Apr. 1, 1940	110	1,703	--	--
1941	924	24,600	Apr. 6, 1941	73	1,280	--	--
1942	954	32,400	Mar. 18, 1942	93	1,503	--	--
1943	974	27,800	Dec. 31, 1942	78	2,333	--	--
1944	1004	17,000	Mar. 17, 1944	81	1,251	--	--
1945	1034	22,300	Mar. 4, 1945	127	1,974	--	--
1946	1054	23,100	May 29, 1946	235	1,862	--	--
1947	1084	30,600	Apr. 6, 1947	205	2,132	--	--
1948	1114	27,700	Mar. 22, 1948	94	1,566	--	--
1949	1144	a/12,800	Jan. 6, 1949	56	1,086	--	--
1950	1174	45,400	Mar. 29, 1950	107	1,465	--	--
1951	1207	26,000	Nov. 27, 1950	100	2,224	d/2,212	1,430
1952	1237,1277	9,500	Apr. 6, 1952	84	1,764	1,772	1,150
1953	1277	10,800	Mar. 27, 1953	89	1,455	1,442	932
1954	1337	13,800	Apr. 28, 1954	61	1,409	1,420	918
1955	1387,1437	12,800	Mar. 6, 1955	43	1,078	1,090	704

a/ Previously published only in WSP 1307.
d/ Previously published only in WSP 1727.
* Adjusted for change in contents in Rushford Lake and Mount Morris Reservoir

TABLE E13A

4-2275. Genesee River at Jones Bridge, near Mount Morris, N. Y. (continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	* Adjusted mean (cfs)	(mgd)
1956	1437	11,900	Mar. 17, 1956	34	2,465	2,466	1,590
1957	1507	11,600	Apr. 7, 1957	96	1,739	1,739	1,120
1958	1557	10,700	Apr. 15, 1958	104	1,391	1,378	891
1959	1627	12,100	Jan. 22, 1959	95	1,621	1,615	1,040
1960	1707	10,400	Apr. 20, 1960	69	2,150	2,155	1,390
1961	S.R.	9,220	Mar. 6, 1961	60	1,548	1,549	1,000
1962	S.R.	9,800	Mar. 16, 1962	52	1,131	1,144	739
1963	S.R.	10,500	Apr. 4, 1963	95	1,363	1,361	880

* Adjusted for change in contents in Rushford Lake and Mount Morris Reservoir.

TABLE E14A

4-2280. Conesus Creek near Lakeville, N. Y.

Location.--Lat 42°51'20", long 77°43'00", on upstream side of right abutment of Millville Bridge, 1-1/2 miles downstream from Lakeville, Livingston County.

Drainage area.--72.0 sq mi.

Gage.--Staff gage. Altitude of gage is 810 ft (from topographic map).

Average discharge.--15 years (1919-34), 48.3 cfs.

Extremes.--1919-34: Maximum discharge, 625 cfs Dec. 1, 1928 (gage height, 3.6 ft); minimum, 0.4 cfs Dec. 18, 20, 21, 1932.

Remarks.--Considerable regulation by Conesus Lake. Water supply for villages of Avon and Geneseo taken from Conesus Lake.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Date	Minimum day (cfs)	Mean (cfs)	(mgd)
1920	524	159	Mar. 17, 1920	a/8	a/37.0	23.9

a/ Previously published only in Wsp 1307.

TABLE E14A

4-2280. Conesus Creek near Lakeville, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1921	524	157	Feb. 16, 1921	2.8	42.2	27.3
1922	544	178	Apr. 1, 1922	2.5	46.8	30.2
1923	564	202	Mar. 20, 1923	--	38.3	24.8
1924	584	285	May 15, 1924	.7	43.4	28.0
1925	604	296	Feb. 23, 1925	10	56.8	36.7
1926	624	308	Apr. 10, 1926	6.9	50.6	32.7
1927	644	188	Mar. 21, 1927	6.9	50.2	32.5
1928	664	625	Dec. 1, 1927	6.1	101	65.3
1929	684	400	Apr. 22, 1929	4.1	60.8	39.3
1930	699	278	Mar. 22, 1930	1.1	51.3	33.2
1931	714	168	Apr. 5, 1931	.6	35.4	22.9
1932	729	275	May 11, 1932	1.4	52.8	34.1
1933	744	189	May 14, 1933	.4	40.6	26.2
1934	759	86	Apr.12-17,1934	.8	17.1	11.1

TABLE E15A

4-2285. Genesee River at Avon, N. Y.

Location.--Lat 42°55'05", long 77°45'30", on left bank at downstream side of bridge on U.S. Highway 20 (State Highway 5), 0.3 mile west of Avon, Livingston County, and 0.8 mile downstream from Conesus Creek.

Drainage area.--1,666 sq mi.

Records available.--August 1955 to September 1963.

Gage.--Water-stage recorder; wire-weight gage read twice daily used for stages below 23.7 ft. Datum of gage is 500.00 ft above mean sea level (levels by Corps of Engineers).

Average discharge.--8 years (1955-63), 1,862 cfs (unadjusted).

Extremes.--1955-63: Maximum discharge, 15,600 cfs Mar. 7, 1956 (gage height, 37.20 ft, from graph based on gage readings); minimum, 56 cfs Oct. 5, 1955 (gage height, 13.73 ft, from graph based on gage readings).

TABLE E15A

4-2285. Genesee River at Avon, N. Y. (Continued)

Remarks.--Diurnal fluctuation at low flow caused by powerplants. Flow regulated to some extent by Rushford Lake (capacity, 1, 106,000,000 cu ft), and, at high flow, by Mount Morris Reservoir (see p. 15).

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Mean (cfs)	Minimum day (cfs)	* Adjusted mean (cfs)	* Adjusted mean (mgd)
1955	1437	--	--	--	--	--	--
1956	1437	15,600	Mar. 7, 1956	2,831	63	2,831	1,830
1957	1507	12,400	Apr. 7, 1957	1,899	115	1,899	1,230
1958	1557	10,800	Apr. 16, 1958	1,495	122	1,482	958
1959	1627	9,720	Apr. 9, 1959	1,837	104	1,831	1,180
1960	1707	9,820	Apr. 17, 1960	2,465	129	2,470	1,600
1961	S.R.	9,620	May 7, 1961	1,732	94	1,732	1,120
1962	S.R.	8,130	Mar. 14, 1962	1,228	82	1,240	801
1963	S.R.	10,200	Apr. 4, 1963	1,407	138	1,405	908

* Adjusted for change in contents in Rushford Lake and Mount Morris Reservoir.

TABLE E16A

4-2289.5. Canadice Lake near Hemlock, N. Y.

Location.--Lat 42°44'25", long 77°34'15", upstream from weir at outlet, in Ontario County, 4 miles southeast of Hemlock, Livingston County.

Drainage area.--12.6 sq mi.

Records available.--April 1903 to September 1963.

Gage.--Hook gage. Datum of gage is 1,093.00 ft above mean sea level (furnished by city of Rochester).

Remarks.--Subsequent to May 1949, discharge from lake below elevation 1,092.00 ft augmented by pumps. Available storage below elevation 1,092.00 ft, 287,058,980 cu ft.

Cooperation.--Records of contents, in cubic feet, furnished by Department of Public Works, city of Rochester, rounded off by Geological Survey.

TABLE E16A

4-2289.5 Canadice Lake near Hemlock, N. Y. (Continued)

References.--Month-end contents figures are to be found in WSP 1307, for the period of record through September 1950, in WSP 1727 for the period October 1950 through September 1960, and in the files of the Geological Survey and the Department of Public Works, city of Rochester.

TABLE E17A

4-2290. Canadice Lake Outlet near Hemlock, N. Y.

Location.--Lat 42°44'25". long 77°34'15", upstream from weir at outlet of Canadice Lake, Ontario County, 4 miles souteast of Hemlock, Livingston County.

Drainage area.--12.6 sq mi.

Records available.--April 1903 to September 1963.

Gage.--Hook gage. Datum of gage is 1,093.00 ft above mean sea level (furnished by city of Rochester). Gage readings have been reduced to elevations above mean sea level.

Average discharge.--60 years (1903-63), 11.8 cfs (unadjusted).

Cooperation.--Records furnished by Department of Public Works, city of Rochester.

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	*Adjusted Mean (cfs)	*Adjusted Mean (mgd)
1903	129	--	--	--	--	--	--
1904	170	--	--	--	15.8	15.5	10.0
1905	170	--	--	--	11.9	12.2	7.88
1906	206	--	--	--	10.2	10.3	6.66
1907	244	--	--	--	15.3	14.2	9.18
1908	244	--	--	--	16.1	16.4	10.6
1909	264	--	--	--	8.82	8.06	5.21
1910	284	--	--	--	8.19	9.58	6.19
1911	304	--	--	--	5.56	5.25	3.39
1912	324	--	--	--	11.5	11.6	7.50
1913	354	--	--	--	15.7	15.4	9.95
1914	384	--	--	--	14.2	15.9	10.3
1915	404	--	--	--	10.9	9.89	6.39

* Adjusted for change in contents in Canadice Lake.

TABLE E17A

4-2290. Canadice Lake Outlet near Hemlock, N. Y. (Continued)

Yearly summary of stream discharge

Water year ending Sept. 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	* Adjusted mean (cfs)	* Adjusted mean (mgd)
1916	434	--	--	--	19.8	19.9	12.9
1917	454	--	--	--	9.91	10.1	6.53
1918	504	--	--	--	11.6	10.9	7.04
1919	504	--	--	--	11.0	11.8	7.63
1920	504	--	--	--	9.24	7.91	5.11
1921	524	--	--	--	8.91	7.92	5.12
1922	544	--	--	--	9.83	12.2	7.88
1923	564	--	--	--	9.62	6.79	4.39
1924	584	--	--	--	9.16	11.5	7.43
1925	604	--	--	--	9.64	7.94	5.13
1926	624	--	--	--	10.8	11.6	7.50
1927	644	--	--	--	9.48	10.6	6.85
1928	664	--	--	--	20.1	19.0	12.3
1929	684	--	--	--	15.1	14.5	9.37
1930	699	--	--	--	10.5	10.8	6.98
1931	714	--	--	--	9.27	9.18	5.93
1932	729	--	--	--	11.8	10.9	7.04
1933	744	--	--	--	10.6	10.1	6.53
1934	759	--	--	--	4.76	5.24	3.39
1935	784	--	--	--	10.0	10.5	6.79
1936	804	--	--	--	11.4	11.9	7.69
1937	824	--	--	--	12.6	13.5	8.72
1938	854	--	--	--	10.2	10.1	6.53
1939	874	--	--	--	11.3	10.7	6.92
1940	894	--	--	--	11.9	13.0	8.40
1941	924	--	--	--	9.75	9.15	5.91
1942	954	--	--	--	12.7	11.5	7.43
1943	974	--	--	--	15.9	18.6	12.0
1944	1004	--	--	--	10.7	9.32	6.02
1945	1034	--	--	--	14.7	16.7	10.8
1946	1054	--	--	--	16.2	13.8	8.92
1947	1084	--	--	--	17.4	15.9	10.3
1948	1114	--	--	--	9.15	10.5	6.79
1949	1144	--	--	--	8.57	4.81	3.11
1950	1174	--	--	--	11.2	9.33	6.03

* Adjusted for change in contents in Canadice Lake.

TABLE E17A

4-2290. Canadice Lake Outlet near Hemlock, N. Y. (Continued)

Yearly-summary of stream discharge

Water year ending September 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	*Adjusted mean (cfs)	*Adjusted mean (mgd)
1951	1207	--	--	--	10.5	18.4	11.9
1952	1237	--	--	--	13.2	10.9	7.04
1953	1277	--	--	--	12.8	11.8	7.63
1954	1337	--	--	--	12.2	12.7	8.21
1955	1387	--	--	--	10.4	9.57	6.19
1956	1437	--	--	--	18.7	21.7	14.0
1957	1507	--	--	--	12.6	11.1	7.17
1958	1557	--	--	--	10.1	12.3	7.95
1959	1627	--	--	--	15.2	11.5	7.43
1960	1707	--	--	--	14.3	14.1	9.11
1961	S.R.	--	--	--	8.85	11.3	7.30
1962	S.R.	--	--	--	11.3	8.81	5.69
1963	S.R.	--	--	--	9.51	9.27	5.99

* Adjusted for change in contents in Canadice Lake.

TABLE E18A

4-2295. Honeoye Creek at Honeoye Falls, N. Y.

Location.--Lat 42°57'25", long 77°35'20", on right bank 25 ft downstream from highway bridge at Honeoye Falls, Monroe County, and 13 miles upstream from mouth.

Drainage area.--197 sq mi.

Records available.--October 1945 to September 1963.

Gage.--Water-stage recorder. Datum of gage is 609.98 ft above mean sea level (levels by Corps of Engineers).

Average discharge.--18 years (1945-63), 167 cfs (adjusted for storage and diversion).

Extremes.--1945-63: Maximum discharge, 4,630 cfs Mar. 28, 1950 (gage height, 6.42 ft), from rating curve extended above 2,100 cfs by logarithmic plotting; minimum, 0.06 cfs Aug. 28, 1949.

TABLE E18A

4-2295. Honeoye Creek at Honeoye Falls, N. Y. (Continued)

Remarks.--Some diversion from and regulation by Hemlock and Canadice Lakes for water supply of city of Rochester. Diurnal fluctuation at low flow caused by mills above station.

Yearly summary of stream discharge

Water year ending September 30

Water year	WSP no.	Momentary maximum Discharge (cfs)		Date	Minimum day (cfs)	Mean (cfs)	*Adjusted mean (cfs)	(mgd)
1946	1054	1,490	Dec.	7,1945	4.4	153	196	127
1947	1084	1,740	June	3,1947	6.8	170	235	152
1948	1114	1,080	Mar.	16,1948	1.3	91.2	145	93.7
1949	1144	1,200	Jan.	6,1949	.1	65.5	97.5	62.9
1950	1174	4,630	Mar.	28,1950	.7	77.0	125	80.8
1951	1207	1,980	Feb.	22,1951	.4	162	253	164
1952	1237	1,610	Mar.	11,1952	.4	98.5	153	98.9
1953	1277	2,080	June	22,1953	.4	93.0	154	99.5
1954	1337	1,890	May	2,1954	.4	107	172	111
1955	1387	3,790	Mar.	1,1955	.3	99.0	148	95.7
1956	1437	3,880	Mar.	7,1956	.7	218	286	185
1957	1507	1,700	May	20,1957	1.0	91.4	142	91.8
1958	1557	1,090	Apr.	8,1958	1.1	87.2	142	91.8
1959	1627	2,690	Jan.	22,1959	.3	123	169	109
1960	1707	3,700	Mar.	30,1960	.6	159	220	142
1961	S.R.	1,570	Apr.	25,1961	.6	86.2	143	92.4
1962	S.R.	1,200	Apr.	30,1962	.9	73.8	114	73.7
1963	S.R.	2,130	Mar.	18,1963	.3	68.8	110	71.1

* Adjusted for diversions from and change in contents in Hemlock and Canadice Lakes; outlet of Honeoye Lake is not controlled (records of diversion and change in contents furnished by Department of Public Works, city of Rochester).

TABLE E19A

4-2305. Oatka Creek at Garbutt, N. Y.

Location.--Lat 43°00'30", long 77°47'25", on right bank 40 ft downstream from highway bridge at Garbutt, Genesee County, 2 miles southwest of Scottsville, and 3-1/2 miles upstream from mouth.

Drainage area.--208 sq mi.

TABLE E19A

4-2305. Oatka Creek at Garbutt, N. Y. (Cont'd)

Records available.--October 1945 to September 1963.

Gage.--Water-stage recorder. Datum of gage is 560.89 ft above mean sea level (levels by Corps of Engineers).

Average discharge.--18 years (1945-63), 198 cfs.

Extremes.--1945-63: Maximum discharge, 6,920 cfs Mar. 31,1960 (gage height, 8.64 ft; minimum,3.3 cfs Sept. 11, 12, 1958; minimum gage height, 1.88 ft June 19,1959, result of regulation.

Remarks.--Chemical analyses of water collected at this site during water years 1960 and 1961 will be published in WSP 1742 and 1882, and are suzzarized on page 42 of this report.

Yearly summary of stream discharge

Water year ending September 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (cfs)
1946	1054	2,830	Jan. 7, 1946	23	244	158
1947	1084	3,680	Apr. 6, 1947	20	302	195
1948	1114	2,150	Mar. 23, 1948	27	189	122
1949	1144	1,030	Feb. 15, 1949	21	126	81.4
1950	1174	6,080	Mar. 29, 1950	19	178	115
1951	1207	2,480	Dec. 5, 1950	26	273	176
1952	1237	2,960	Mar. 12, 1952	20	190	123
1953	1277	1,080	Mar. 28, 1953	16	130	84.0
1954	1337	2,280	Feb. 17, 1954	23	171	111
1955	1387	5,310	Mar. 2, 1955	19	195	126
1956	1437	5,880	Mar. 8, 1956	19	315	204
1957	1507	3,500	Jan. 24, 1957	25	209	135
1958	1557	2,320	Apr. 8, 1958	16	149	96.3
1959	1627	3,240	Apr. 3, 1959	21	213	138
1960	1707	6,920	Mar. 31, 1960	23	247	160
1961	S.R.	3,090	Apr. 26, 1961	16	178	115
1962	S.R.	1,410	Mar. 13, 1962	17	123	79.5
1963	S.R.	2,610	Mar. 18, 1963	21	137	88.5

TABLE E20A

4-2310. Black Creek at Churchville, N. Y.

Location.-- Lat 43°06'00", long 77°53'00", on right bank at east end of Carrol Street in Chruchville, Monroe County, 60 ft downstream from main-line tracks of New York Central Railroad and 1 mile upstream from unnamed tributary.

Drainage area.--123 sq mi.

Records available.-- October 1945 to September 1963.

Gage.--Water-stage recorder. Datum of gage is 552.45 ft above mean sea level (levels by Corps of Engineers).

Average discharge.--18 years (1945-63), 102 cfs.

Extremes.--1945-63: Maximum discharge, 4,880 cfs Mar. 31, 1960 (gage height, 9.44 ft); minimum, 0.3 cfs Aug. 5-7, Sept. 15, 1959 (gage height, 0.93 ft).

Remarks.--Prior to May 1952, small diversion by New York Central Railroad Co. and slight regulation by pumping operations above station. Chemical analyses of water collected at this site during water year 1962 are published in WSP 1942, and are summarized on page 42 of this report.

Yearly summary of stream discharge

Water year ending September 30

Water year	WSP no.	Momentary maximum		Minimum day	Mean	
		Discharge (cfs)	Date	(cfs)	(cfs)	(mgd)
1946	1054	1,740	Mar. 5, 1946	3.4	131	84.7
1947	1084	1,940	Apr. 6, 1947	4.9	163	105
1948	1114	1,540	Feb. 20, 1948	3.1	97.2	62.8
1949	1144	800	Feb. 16, 1949	2.4	61.2	39.6
1950	1174	4,750	Mar. 28, 1950	.9	106	68.5
1951	1207	1,430	Feb. 21, 1951	.7	145	93.7
1952	1237	1,620	Mar. 12, 1952	2.2	93.1	60.2
1953	1277	745	Mar. 28, 1953	2.1	52.3	33.8
1954	1337	1,660	Feb. 18, 1954	2.2	79.8	51.6
1955	1387	1,780	Mar. 2, 1955	1.4	103	66.6
1956	1437	2,980	Mar. 8, 1956	3.3	177	144
1957	1507	1,910	Jan. 24, 1957	3.0	106	68.5
1958	1557	835	Apr. 8, 1958	2.1	69.3	44.8
1959	1627	1,700	Apr. 3, 1959	.3	116	75.0
1960	1707	4,880	Mar. 31, 1960	1.2	138	89.2
1961	S.R.	702	Apr. 26, 1961	2.0	67.4	43.5
1962	S.R.	1,530	Mar. 13, 1962	1.1	58.6	37.9
1963	S.R.	2,460	Mar. 18, 1963	.7	80.9	52.3

TABLE E21A

4-2315. Genesee River at Rochester, N. Y.

Location.--Lat 43°07'25", long 77°37'55", on right bank in pumphouse at downstream side of Elmwood Avenue Bridge, about 3 miles upstream from Erie Canal aqueduct crossing, 3-1/4 miles downstream from Black Creek, 3-1/2 miles upstream from center of city of Rochester, Monroe County, and 7-1/2 miles upstream from mouth.

Drainage area.--2,450 sq mi. (revised).

Gage.--Water-stage recorder. Datum of gage is 506.848 ft above mean sea level, Barge Canal datum. Prior to December 1910, staff gage on downstream end of first pier from right abutment at same datum.

Average discharge.--13 years (1905-18), 2,580 cfs.

Extremes.--1904-18: Maximum discharge, 48,300 cfs Mar. 30, 1916 (gage height, 12.3 ft); minimum, 102 cfs Nov. 1, 1912.

Remarks.--Some diversion from Hemlock Lake for water supply of city of Rochester, and from Allen Creek for water supply of Erie Canal. Some water may have been received from 26.6 sq mi on Genesee-Allegheny divide through Cuba Reservoir. Slight regulation by mills, reservoir, and lakes.

Yearly summary of stream discharge

Water year ending September 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1904	206	--	--	--	--	--
1905	206	--	--	--	--	--
1906	206	a/15,500	Mar. 29, 1906	400	1,890	1,220
1907	244	a/15,000	Jan. 9, 1907	310	2,880	1,860
1908	244	a/21,800	Mar. 17, 1908	--	3,460	2,240
1909	264	a/21,400	May3, 4, 1909	--	2,180	1,410
1910	284	a/29,000	Mar. 5, 1910	174	2,180	1,410
1911	304	14,700	Mar. 29, 1911	206	2,310	1,490
1912	324	25,500	Apr. 3, 1912	250	2,550	1,650
1913	354	42,000	Mar. 28, 1913	102	2,820	1,820
1914	384	26,900	Mar. 30, 1914	170	2,580	1,670
1915	404	20,000	Feb. 26, 1915	313	1,960	1,270
1916	434	48,000	Mar. 30, 1916	264	3,930	2,540
1917	454	14,200	Mar. 14, 1917	243	2,190	1,420
1918	474	27,900	Mar. 16, 1918	300	2,610	1,690

a/ Maximum daily.

TABLE E22A

4-2320. Genesee River at Driving Park Avenue, Rochester, N. Y.

Location.--Lat 43°10'50", long 77°37'40", on right bank at Rochester, Monroe County, 40 ft downstream from plant 5 of Rochester Gas & Electric Corp. and 100 ft upstream from Driving Park Avenue Bridge.

Drainage area.--2,467 sq mi.

Records available.--December 1919 to September 1963.

Gage.--Water-stage recorder at present site and datum since June 20, 1956. Datum of gage is 247 above mean sea level, Erie (Barge) Canal datum. Prior to Apr. 4, 1927, water-stage recorder and chain gage in plant 5 at datum 3.00 ft higher. Apr. 4, 1927, to June 19, 1956, water-stage recorder at present site at datum 3.00 ft higher.

Average discharge.--43 years (1920-63), 2,738 cfs.

Extremes.--1919-63: Maximum discharge, 34,400 cfs Mar. 19, 1942; maximum gage height, 17.08 ft Apr. 2, 1940 (present datum); minimum discharge, less than 10 cfs, occurred during low-water periods in some years when powerplant was shut down; minimum daily 91 cfs Jan. 9, 29, Feb 1, 8, 1961.

Maximum discharge known, about 54,000 cfs Mar. 18, 1865.

Remarks.--Extensive diurnal fluctuation caused by powerplants above station. New York State Erie (Barge) Canal crosses river 5.4 miles above station. Water diverted by the canal from Lake Erie is discharged into river from the west, the canal again diverting a smaller amount of water from river to the east. Additional regulation is provided by Rushford Lake and Mount Morris Reservoir. Chemical analyses of water collected at this site during water year 1955 are published in WSP 1400, and are summarized on page 42 of this report.

Yearly summary of stream discharge

Water year ending September 30

Water year	WSP no.	Momentary maximum Discharge (cfs)	Momentary maximum Date	Minimum day (cfs)	Mean (cfs)	Mean (mgd)
1920	504	26,000	Mar. 17, 1920	--	--	--
1921	524	a/16,500	Mar. 9, 1921	560	2,200	1,420
1922	544	15,700	Apr. 2, 1922	420	2,930	1,630
1923	564	19,300	Mar. 13, 1923	389	2,120	1,370
1924	584	21,600	Apr. 20, 1924	--	2,780	1,800
1925	604	24,800	Feb. 25, 1925	661	2,380	1,540

a/ Previously published only in WSP 1307.

TABLE E22A

4-2320. Genesee River at Driving Park Avenue, Rochester, N. Y. (Cont'd)

Yearly summary of stream discharge

Water year ending September 30

Water year	WSP no.	Momentary maximum		Minimum day	Mean	
		Discharge (cfs)	Date	(cfs)	(cfs)	(mgd)
1926	624	22,800	Apr. 10, 1926	689	2,730	1,760
1927	644	22,400	Jan. 24, 1927	219	3,070	1,980
1928	664	29,600	Dec. 2, 1927	772	4,110	2,660
1929	684	23,800	Apr. 23, 1929	740	3,390	2,190
1930	699	19,200	Jan. 16, 1930	686	3,010	1,950
1931	714	17,300	Mar. 30, 1931	350	2,010	1,300
1932	729	19,400	May 11, 1932	625	2,930	1,890
1933	744	19,900	Mar. 16, 1933	586	2,460	1,590
1934	759	22,300	Mar. 5, 1934	451	1,740	1,120
1935	784	22,700	Jan. 23, 1935	610	2,383	1,540
1936	804	27,700	Mar. 28, 1936	500	2,795	1,810
1937	824	20,200	Apr. 23, 1937	465	2,854	1,840
1938	854	19,000	Mar. 7, 1938	628	2,487	1,610
1939	874	19,000	Feb. 23, 1939	600	2,474	1,600
1940	894	33,500	Apr. 2, 1940	375	2,712	1,750
1941	924	22,700	Apr. 7, 1941	676	2,264	1,460
1942	954	34,400	Mar. 19, 1942	597	2,697	1,740
1943	974	25,400	Jan. 1, 1943	720	4,074	2,630
1944	1004	18,900	Mar. 17, 1944	705	2,448	1,580
1945	1034	24,700	Mar. 5, 1945	711	3,447	2,230
1946	1054	18,900	Jan, 7, 1946	458	3,376	2,180
1947	1084	23,800	Apr. 8, 1947	782	3,859	2,490
1948	1114	21,600	Mar. 23, 1948	685	2,723	1,760
1949	1144	16,400	Feb. 16, 1949	383	2,041	1,320
1950	1174	33,100	Mar. 30, 1950	418	2,510	1,620
1951	1207	20,200	Feb. 22, 1951	311	3,666	2,370
1952	1237	17,700	Mar. 12, 1952	286	2,886	1,870
1953	1277	17,100	Mar. 25, 1953	483	2,328	1,500
1954	1337	17,500	Feb. 17, 1954	449	2,446	1,580
1955	1387	19,100	Mar. 2, 1955	340	2,082	1,350
1956	1437	24,300	Mar. 8, 1956	417	4,237	2,740
1957	1507	17,000	Apr. 8, 1957	436	2,710	1,760
1958	1557	14,900	Apr. 7, 1958	316	2,166	1,400
1959	1627	17,700	Apr. 2, 1959	370	2,744	1,770
1960	1707	25,800	Mar. 31, 1960	482	3,606	2,330
1961	S.R.	15,400	Apr. 26, 1961	91	2,444	1,580
1962	S.R.	11,900	Apr. 8, 1962	310	1,718	1,110
1963	S.R.	21,500	Mar. 18, 1963	438	2,092	1,350

GENERALIZED FREQUENCIES

4A. GENERAL

Generalized frequency curves were developed in order to determine flood peak discharge-frequencies at ungaged sites. They were developed separately for the Upper and Lower basins for the following two reasons. First, as mentioned in the main appendix topographic differences between the Upper and Lower basins, and second, the Lower Basin is protected by Mount Morris Reservoir. The generalized frequencies computed for the Genesee River Basin are explained in subsequent paragraphs.

5A. UPPER BASIN

The antilog (Qm) of the mean logarithm of peak flows (m) was plotted versus drainage area for all of the stations analyzed. The results are shown on figure E1A. Five stations were found to plot on a reasonably straight line on log - log paper due to the similar topographic characteristics of their basins. These stations are:

Genesee River at Scio - 47 years of record
Genesee River at Portageville - 55 years of record
Genesee River at Jones Bridge - 58 years of record
Canaseraga Creek near Dansville - 50 years of record
Little Tonawanda Creek at Linden - 50 years of record

Although Jones Bridge is in the Lower Basin, the majority of the drainage area above Jones Bridge is in the Upper Basin, so it was felt that Jones Bridge discharges actually reflect Upper Basin topography. Canaseraga Creek is also in the Lower Basin, but as described previously, the Canaseraga above Dansville is very similar to the Upper Basin. Little Tonawanda Creek is in the Tonawanda Creek basin, which is directly adjacent to the Genesee basin on the west, and it also is similar in topography to the Upper Genesee Basin. Scio and Portageville are both in the Upper Basin. After the five stations were chosen, another plot was made on log-log paper, this one showing points for 1, 2, 5, 10, 50, and 99 percent exceedence frequencies. A line of best fit was determined for each frequency by the method of least squares. The equations for each line are listed in table E23A.

TABLE E23A. - Generalized frequency equations, Upper Basin

Percent chance of exceedence	Recurrence interval, years	Equation of straight line on log-log paper
1	100	$Q_{100} = 426 A^{.682}$
2	50	$Q_{50} = 380 A^{.692}$
5	20	$Q_{20} = 283 A^{.708}$

TABLE E23A. - Generalized frequency equations, Upper Basin (Contd)

Percent chance of exceedence	Recurrence interval, years	Equation of straight line on log-log paper
10	10	$Q_{10} = 224\ A^{.720}$
50	2	$Q_m = 93.8\ A^{.769}$
99	1 *	$Q_1 = 19.1\ A^{.855}$

* Approximate

A = Drainage area in square miles

Q_{100} = Annual peak discharge for 100-year flood in cfs.

The curves as determined by this method are shown on plate E14.

6A. LOWER BASIN

For Lower Basin generalized frequencies, the flows for the Genesee River at Jones Bridge and the Genesee River at Rochester for the period 1952 thru 1964 were used, resulting in generalized frequency curves for post Mount Morris Dam conditions. Since only two points were used, straight lines were drawn connecting the points, and the least-square method was not used. The resulting curves are shown on plate E15.

7A. FREQUENCY CURVES FOR GENESEE RIVER IN WELLSVILLE

In "Design Memorandum for Rectification of Deficiencies in Completed Local Protection Project," Wellsville, N. Y. April 1966,discharge frequency curves were developed for 10 reaches in and near the village of Wellsville, New York. Since the reaches are all in the same general area, three frequency curves sufficed to define the discharge frequencies for all of the reaches. Becuase of the proximity of Wellsville to Scio, New York and because the drainage area of the Genesee River at Wellsville is 288 square miles as compared to 309 square miles for the Genesee at Scio, the procedure for determining discharge frequency curves for Wellsville varied from the methods used for other ungaged sites. In the Design Memorandum referred to above, eleven Western New York gaging stations were used to determine the exponent n in the formula,
Then the mean annual peak discharges for each reach were determined by the formula

The exponent .774 for the eleven Western New York stations compares well with the value .769 determined in this study from 5 Upper Basin stations. To determine the remainder of each frequency curve, the value of $\bar{s}$ was assumed to be the same for all reaches as the value of $\bar{s}$ for the record at Scio, or .222. The result of the above procedure is that the frequency curves for Wellsville are weighted heavily by the record at the nearest gage site, Scio.

8A. FREQUENCY CURVES FOR THE CANASERAGA CREEK BASIN

There are five locations in the Canaseraga Creek Basin which have stream gages currently or have had them in the past. They are listed in table E24A with their respective periods of record. As mentioned previously, the gage at Canaseraga was just installed in 1964. The gage at Dansville has 49 years of record and was discussed previously as one of the five stations used for Upper Basin generalized frequency curves. The statistics for Dansville are shown in tables E8 of the main report, and E25A and the discharge frequency curve is shown on plate E17. The Groveland gage had ten years of record when it was discontinued in 1964, but because there were large amounts of overbank flow which bypassed the gage, records, except for low flows, were not reilable. The gage at Shakers Crossing has only six years of record, so a direct statistical analysis was not considered reliable. To analyze the frequencies at Shakers Crossing, the annual peak flows for the six years of record available were correlated with the concurrent annual peak flows at Dansville, in accordance with Beard's [6] method for extending the records of a short-term station. The resulting curve is shown on plate E17. The gage on Keshequa Creek at Sonyea had 15 years of record, but the records were very unreliable because of poor rating at high discharges. For this reason, the discharge frequency curve for Keshequa Creek was developed using generalized frequency curves described above in paragraph E5A. Although Keshequa Creek is a tributary to Canaseraga Creek which enters the Genesee River in the Lower Basin, its topography is steep and rugged, so the generalized frequency curves for the Upper Basin were used. The discharge frequency curve for Keshequa Creek at Sonyea is also shown on plate E17.

TABLE E24A Stream Gaging Stations in the Canaseraga Creek Basin

Stream	Station	Drainage area, square miles	Period of Record	Length of record, years
Canaseraga Creek	Canaseraga	58.3	1964	1
	Dansville	153	1910-1964	49
	Groveland	181	1955-1964	10
	Shakers Crossing	333	1958-1964	6
Keshequa Creek	Sonyea	69.1	1918-1932	15

COMPUTATION METHODS

9A. MEAN ANNUAL FLOW

The statistical analysis for mean annual flow was done on an IBM 7044 computer, utilizing a program developed by the Buffalo District. Table E25A is a typical output sheet directly from the computer. The statistical analyses were performed on logarithms of flows, since logarithms usually are more normally distributed than actual flows.

TABLE E25A Computer output - average annual flow statistics

CANASERAGA CR. NEAR DANSVILLE, N.Y. D.A. 153 SQ MI
FREQUENCY AND STATISTICS OF AVERAGE YEARLY FLOWS 1911 - 1964
D.A. = 153.00 SQ. MI.

DATE	DISCHARGE IN CFS	MAG	PLOTTING POSITION IN PERCENT
1916	277.00	1	1.405
1928	227.00	2	3.429
1956	222.00	3	5.454
1951	220.00	4	7.479
1947	218.00	5	9.504
1960	215.00	6	11.529
1943	211.00	7	13.553
1945	204.00	8	15.578
1929	198.00	9	17.603
1912	185.00	10	19.628
1927	171.00	11	21.653
1936	166.00	12	23.678
1922	164.00	13	25.702
1946	163.00	14	27.727
1918	162.00	15	29.752
1957	161.00	16	31.777
1940	158.00	17	33.802
1952	154.00	18	35.826
1930	151.00	19	37.851
1939	149.00	20	39.876
1935	149.00	21	41.901
1942	148.00	22	43.926
1961	147.00	23	45.950
1959	147.00	24	47.975
1964	146.00	25	50.000
1937	145.00	26	52.025
1953	141.00	27	54.050
1919	141.00	28	56.074
1932	138.00	29	58.099
1926	138.00	30	60.124
1950	137.00	31	62.149
1924	137.00	32	64.174
1948	135.00	33	66.198
1911	135.00	34	68.223
1941	133.00	35	70.248
1923	127.00	36	72.273
1954	123.00	37	74.298
1938	123.00	38	76.322
1958	121.00	39	78.347
1944	121.00	40	80.372
1963	112.00	41	82.397

TABLE E25A Comupter output - average annual flow statistics (Contd)

CANASERAGA CR. NEAR DANSVILLE, N.Y. D.A. 153 SQ MI
FREQUENCY AND STATISTICS OF AVERAGE YEARLY FLOWS 1911 - 1964
D.A. = 153.00 SQ. MI.

DATE	DISCHARGE IN CFS	MAG	PLOTTING POSITION IN PERCENT
1925	112.00	42	84.422
1933	110.00	43	86.447
1921	109.00	44	88.471
1962	104.00	45	90.496
1955	100.00	46	92.521
1931	100.00	47	94.546
1949	93.80	48	96.571
1934	84.80	49	98.595

MEAN LOGARITHM. M= 2.1668

STANDARD DEVIATION, S= 0.1110

FREQUENCY, PERCENT	15.9	50.0	84.1
DISCHARGE	189.62	146.84	113.71

10A. FLOOD PEAK FREQOENCIES

The mean logarithm of the annual peak discharges is "m" and the standard deviation of the logarithms is "$\bar{s}$". The frequency curve for each station can then be found by plotting values of the antilog of $(m + k\bar{s})$ where k is a parameter which varies with frequency. For a normal distribution and a long period of record, k equals 1.00 at 15.9 percent and - 1.00 at 84.1 percent. Plotting the antilogs of $(m + \bar{s})$, $(m - \bar{s})$, and m on logarithmic probability paper then yields a straight line. When the period of record is short, k is altered, and the frequency curve is no longer a straight line. For those stations with fifty or more years of record, the curve is virtually straight and was assumed so for ease in computations. A portion of the curves were developed by conventional desk-calculator computations, while some were developed on the 7044 electronic computer. Table E26A is typical output directly from the computer. In addition to the mean and standard deviation, it shows the peak discharges rearranged in order of magnitude, and the corresponding plotting positions for each peak. These positions are found by use of the formula

$$P_1 = 100 \quad (1-0.5^{I/N})$$

where P_1 is the plotting position of the largest event and N is the number of years of record. Then P_N, the plotting position of the smallest event, is $100 - P_1$, and intermediate values are found by *linear interpolation. Unless the plotted points showed a marked* deviation from the statistical curve described above, the statistical curve was used. The plotting point curve was used for the Genesee River at Rochester only, since it showed a definite convex downward curvature. This curve is shown on plate E15.

TABLE E26A

FREQUENCY OF ANNUAL PEAK DISCHARGES - CANASERAGA CR. NR. DANSVILLE, N.Y.
USGS NO. 4-2250 RECORDS FOR 1913, 1914, 1915, and 1934 ARE MISSING
D.A. = 153.00 SQ. MI.

DATE	DISCHARGE IN CFS	MAG	PLOTTING POSITION IN PERCENT
07/23/40	9110.00	1	1.377
03/17/42	8400.00	2	3.361
07/08/25	8390.00	3	5.346
04/25/61	8230.00	4	7.331
05/26/43	7560.00	5	9.315
03/28/50	7170.00	6	11.300
11/30/27	6900.00	7	13.284
05/16/16	6600.00	8	15.269
05/22/19	6540.00	9	17.254
05/17/45	6370.00	10	19.238
03/19/48	6350.00	11	21.223
03/30/51	6150.00	12	23.208
04/21/29	6150.00	13	25.192
01/22/59	6000.00	14	27.177
04/05/41	5860.00	15	29.161
04/27/54	5240.00	16	31.146
03/30/60	5170.00	17	33.131
04/05/47	4910.00	18	35.115
07/09/12	4900.00	19	37.100
02/20/39	4860.00	20	39.085
03/16/44	4490.00	21	41.069
03/05/38	4420.00	22	43.054
03/05/64	4370.00	23	45.038
06/01/46	4260.00	24	47.023
03/25/36	4240.00	25	49.008
03/01/55	3990.00	26	50.992
07/24/20	3950.00	27	52.977
03/24/53	3790.00	28	54.962
02/12/18	3790.00	29	56.946
03/11/52	3630.00	30	58.931
03/04/23	3570.00	31	60.915
09/04/22	3500.00	32	62.900
03/07/56	3380.00	33	64.885
05/09/32	3350.00	34	66.869
02/11/25	3240.00	35	68.854
03/14/33	3160.00	36	70.839
04/06/58	2910.00	37	72.823
06/21/37	2830.00	38	74.808
04/06/57	2810.00	39	76.792
03/17/63	2770.00	40	78.777

TABLE E26A

FREQUENCY OF ANNUAL PEAK DISCHARGES - CANASERAGA CR. NR. DANSVILLE, N.Y.
USGS NO. 4-2250 RECORDS FOR 1913, 1914, 1915, AND 1934 ARE MISSING
D.A. = 153.00 SQ. MI.

DATE	DISCHARGE IN CFS	MAG	PLOTTING POSITION IN PERCENT
05/24/27	2600.00	41	80.762
05/13/31	2400.00	42	82.746
06/11/17	2380.00	43	84.731
04/08/26	2100.00	44	86.716
03/27/11	1880.00	45	88.700
03/17/30	1850.00	46	90.685
09/30/24	1830.00	47	92.669
02/14/49	1680.00	48	94.654
03/12/62	1570.00	49	96.639
03/09/21	1270.00	50	98.623

MEAN LOGARITHM, M = 3.6012

STANDARD DEVIATION. S = 0.2129

FREQUENCY, PERCENT	15.9	50.0	84.1
DISCHARGE	6519.10	3992.57	2445.22

11A. USE OF HIGHWATER PROFILES

When sufficient data were available, profiles were drawn, connecting points for which water surfaces were known for given discharges. Then, at each desired ungaged section, the profiles were read, to determine rating curves. This procedure was used in the Lower Basin on the main stem of the Genesee River.

12A. CONVEYANCE CURVES

For reaches which were unusually long, with starting backwater elevations not easily determined, or for reaches in which there were few data on water surface elevations for known discharges, the conveyance curve method was utilized. This method makes use of Manning's equation for open channel flow,

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where Q = discharge in cfs
n = Manning's coefficient
A = cross-sectional area under water
R = hydraulic radius
S = slope of water surface

A and R can be determined from a cross section of the stream. Manning's "n" is estimated for the channel conditions involved, and S is estimated from the general thalweg slope of the stream in the reach in question. This method was used in the upper reach of the Canaseraga valley and on the main stem of the Genesee River, in the Upper Basin.

13A. BACKWATER TECHNIQUES

For relatively short reaches or small drainage areas where a moderate amount of backwater computations gave adequate results, this was the method used. For example, rating curves for Red Creek in the Lower Basin, portions of Canaseraga Creek, and portions of the main stem of the Genesee River in Rochester and Wellsville, were determined by backwater computations. The backwater was started at a known or estimated elevation for a given discharge and computation proceeded in accordance with EM 1110-2-1409, "Backwater Curves in River Channels." Values of Manning's "n" coefficient for open channels were either estimated from knowledge of the streambed characteristics, or, where data allowed, the "n" value was varied until the water surface elevation obtained by backwater agreed sufficiently with known water surface elevations (highwater marks) for a given discharge.

14A. UNIT HYDROGRAPHS

Unit hydrographs were derived from one or more storms, for seven sites, covering both the Upper and Lower Basin. Where it was possible, storms were selected which had one inch or more of rainfall which fell in a relatively continuous manner, without multiple isolated periods of high intensity. Storms for which many continuous hourly rainfall records were available were chosen over storms which had only a few recording gages in operation, so that the periodic rainfall on the basin in question could be better estimated. The general procedure for deriving unit graphs, after adequate storms were chosed, is as follows:

(1) Determine and plot the discharge hydrograph at the desired station, using the stage hydrograph and the discharge rating curve for the station.

(2) Estimate base flow for the duration of the flood studied and subtract it from the total flow to determine the runoff hydrograph.

(3) Determine the volume of water under the runoff hydrograph, expressed as inches over the basin studied.

(4) Plot rainfall values for the storm on a map of the basin, and draw lines of equal rainfall.

(5) Determine the average rainfall, for the total storm period, for the basin studied, and then determine incremental rainfall for smaller periods of time (dictated by the size of the basin) based on the incremental periodic rainfall at hourly recording stations in or near the basin.

(6) Estimate initial losses and infiltration losses which, when subtracted from the total average basin rainfall determined in 5, leave rainfall excess equal to the runoff determined in 3 above.

(7) Using a rainfall period short enough to adequately indicate the runoff response of the basin, apply incremental rainfall to the ordinates of an estimated unit graph to reproduce the runoff hydrograph determined in 2 above. The trial unit graph volume should be equal to one inch of rainfall on the basin.

(8) If the runoff hydrograph so reproduced does not satisfactorily conform with the known runoff hydrograph, alter the trial unit graph and repeat step 7 until the two hydrographs agree, to the required degree of accuracy.

(9) Follow steps 1 thru 8 for as many storms as possible to determine either an average unity hydrograph or the one which is felt to best represent the response of the basin to rainfall excess.

15A. COMPUTER TECHNIQUES FOR DERIVING UNIT HYDROGRAPHS

During the latter stages of this study use was made of a computer program, developed by the Hydrologic Engineering Center of the Corps of Engineers in Sacramento, California. The program, 23-J2-L211, Unit Graph and Loss Rate Optimization, finds the best combination, of unit hydrograph ordinates and initial and infiltration losses, which reproduces the storm hydrograph. As input, it accepts the storm discharge hydrograph, incremental rainfall for the storm period, and the drainage area of the basin. As output it presents the unit hydrograph, rainfall and excess, and actual and reconstituted storm hydrographs. Although unit hydrographs for the Genesee basin had already been developed by conventional means, unit graphs for two locations were found by this program, and checked well with the established unit graphs, indicating that in the future, use of the computer method should greatly facilitate the derivation of unit hydrographs.

16A. SYNTHETIC UNIT GRAPHS

When no stream gage records are available for a stream for which a unit hydrograph is desired, the unit graph must be determined by some artificial means. These methods usually involve relating unit graph characteristics to basin parameters at known stations, then, using the relationship developed, determining a unit graph at an ungaged site which satisfies the relationship. Many methods have been proposed for determining synthetic unit graphs, and four methods which were used in this study are described below, with their advantages and disadvantages.

(1) Drainage area ratios. When a unit hydrograph is desired at a location reasonably close to an existing stream gage, a synthetic unit hydrograph can be determined by reducing the discharge ordinates of the known unit graph at the gage by the ratio of the ungaged area to the gaged area. This method is fast and simple, but it obviously makes the assumption that the unit graph ordinates are directly proportional to drainage area alone. This is not strictly true for two reasons. First, there are many other basin characteristics which affect the unit hydrograph, and all these would have to be identical in order for the unit graph to be a function of the drainage area alone. Second, even if the above-mentioned parameters were identical, the unit graph ordinates would probably not vary linearly as the drainage area, but as some complex function. However, as stated above, for sites that are reasonably close to a gaged station, this method gives good results. In this study, it was used primarily in the Lower Basin, where basin-to-basin characteristics, other than drainage area, do not vary widely.

(2) Snyder's Method. A widely used means for determining synthetic unit graphs at ungaged sites is Snyder's[11] method. Snyder analyzed a large number of hydrographs from drainage basins in the Appalachian Mountains, and found that for the type of basin he studied the unit hydrograph could be adequately determined by using drainage area, length of the main stream (L), and the length of the main stream from the mouth to the geometric centroid of the basin (L_{ca}). He developed two constants: C_t, which is a function of L and L_{ca} and determines the time of peak (t_p) of the unit hydrograph, and C_p, which determines the peak value (Q_p) of the unit hydrograph. The usual procedure in applying this method is to compare basin characteristics (stream slope, shape, drainage pattern, etc.) of the ungaged basin with the same characteristics of gaged streams. If a gaged stream is found which is sufficiently similar to the ungaged stream, its C_t and C_p can be determined and applied to the ungaged stream to determine t_p and Q_p for the ungaged area. The values t_p and Q_p determine one point on the unit hydrograph for the ungaged area. Then an estimate of the length of the base of the unit graph must be made and a unit graph drawn which has a volume of one inch on the drainage area. This method has advantages over the drainage area ratio method because it adds two basin characteristics, L and L_{ca}, which help to determine unit graph characteristics more reliably. Its disadvantages are that it is often difficult, when deriving a synthetic unit graph for an ungaged area, to find a gaged area with characteristics similar to the ungaged area, and also that the procedure for drawing the unit graph to have an inch of volume, in addition to being tedious, leaves the correctness of the shape of the hydrograph up to the experience of the hydrologist involved. The Corps of Engineers[12] has developed curves which relate unit graph widths, at different percentages, to the peak value, but these curves are envelopes and still leave much leeway in the shape of the unit graph. Synthetic unit graphs in the Lower Basin were also determined by this method since, as was mentioned above, the streams in the Lower Basin have similar basin parameters, allowing C_t and C_p to be estimated with some reliability.

(3) Taylor-Schwarz Method. The Taylor-Schwarz[13] method of determining unit graphs for ungaged areas is based primarily on Snyder's method, but it adds a basin parameter, stream slope (S_{st}), and presents a monograph for determining Q_p and t_p. The monograph is entered with the drainage area, L, L_{ca}, and S_{st} of the ungaged basin, and Q_p and t_p are read off. This method gives an equation which determines the length of the time base of the unit hydrograph so that the unit graph may be more easily drawn than in Snyder's method. Again Q_p and t_p define one point on the unit graph, and it is drawn to have a volume of one inch. The advantages of this method are its addition of the stream slope as a parameter and its ease of computation. Its disadvantages are that the monograph is restricted to streams whose product of L and L_{ca} is greater than 20 and less than 15,000 and it also has the same hydrograph-shaping

restriction as does Snyder's method. This method was used for preliminary unit graph studies in the Upper Basin and in the upper portions of the Canaseraga basin, because there is quite a variation in stream slopes in these areas, and the Taylor-Schwarz method utilizes stream slope as a basin parameter.

(4) Clark's method. The final synthetic unit hydrographs for the Upper Basin, and for the portions of the Canaseraga basin which have Upper Basin characteristics, were determined by Clark's [14] method. Since udnerstanding of this method also involves derivation of unit graphs at gaged stations by Clark's method, this procedure will be discussed first. Clark presents the philosophy that unit graph characteristics are not simply related to basin parameters, but that they are basin parameters. He then used these basin parameters to route rainfall excess thru a given basin to determine a hydrograph. If storm excess is routed thru the basin, the result is a storm hydrograph, and if one inch of rainfall is routed, the result is a unit hydrograph. In deriving a unit hydrograph of a gaged stream, a detailed hydrograph analysis of the rainfall and the discharge is not necessary, and no trial and error method is needed to develop the unit graph which reporduces a storm hydrograph. The methods uses three basin parameters, drainage area, a "time of concentration" (TC), and a storage factor (R), along with a length-versus-area curve of the basin which intrinsically involves the L and L_{ca} used previously in Snyder's Method. The following definitions will be clarified by references to figure E2A. TC is defined as the time from the end of major rainfall excess to the point of inflection on the falling limb of the hydrograph, at which point in time Clark assumes that the entire basin area is contributing to runoff. R is a storage factor which is equal to the discharge at the inflection point divided by the slope of the hydrograph at the inflection point. TC and R for a fictitious hydrograph are shown on figure E2A. The length-versus-area curve for a basin is simply the area above a given river mile, measured also along all tributaries, and plotted versus the given river distance. Figure E3A shows a typical basin divided into equal river lengths, and figure E4A shows typical length-versus-area curves. If the time of travel of streamflow thru each segment on figure E3A were equal, then the lines could be assumed to be lines of equal time of travel, or isochrones, and the length-area curve, expressed in percentages, becomes a time-area curve. If incremental values of area are plotted versus length (figure E5A) the resulting curve can be used to determine outflow from each areal segment. Rainfall escess volume on each incremental area could be converted to an equivalent flow volume and so the volume being contributed at the end of a period of excess by each incremental area can be determined. Since all of this volume does not reach the gage at the same time, it must be routed down the basin. Each incremental volume can be treated as an inflow, and lagged and decreased (attenuated) before it reaches the

gage. This is accomplished by using R as an attenuating value in the Muskingum-type equations,

$$X = \frac{T}{R + .5T}$$

and

$$1\text{-}x = \frac{R - .5T}{R + .5T}$$

where T is a small-time increment. The routing is then based on the equation,

$$Q_2 = xI_2 + (-x)\,O_1$$

where I is the "inflow" or lagged volume and O is the outflow or attenuated volume. The subscripts refer to the times T_1 and T_2. Table E27A shows a typical Clark unit graph determination. The O's resulting from the above routing are unit hydrograph ordinates for a unit graph time increment of T, (Table E27A, Column 6) If T is very small compared to the TC of the basin, the unit graph thus derived is an "instantaneous unit hydrograph"' (IUH), or the hydrograph resulting from one inch of rainfall falling instantaneously (or in a very short period of time, relative to basin response). If a unit graph for a longer rainfall duration, T_R, is desired, it is easily determined from the instantaneous unit hydrograph by averaging the ordinates of the IUH for each T_R period. (Table E27A, Column 7) The procedure for determining a unit hydrograph at a gaged station is then to determine TC and R from the discharge hydrograph, calculate the routing coefficients x and (1-x), and apply them to the time-area curve, to obtain the IUH. Then=the unit graph for any desired rainfall duration can be found as described above, and it will automatically have one inch of volume. To use the Clark method for determination of synthetic unit graphs, first the values of TC and R for gaged streams are related to basin characteristics. Then for an ungaged stream the TC and R are determined from the above relationship, and the time are curve is developed. This can be determined from quadraugle sheets or any convenient map showing the streams in the basin. Then the routing coefficients x and (1-x) are determined and utilized with the time-area curve, as mentioned above, to find the unit hydrograph for the desired T_R period. For this study of the Genesee Basin, Clark's coefficients were found to vary predominantly with drainage area, expecially in the Upper Basin. Two combinations gave reasonably straight lines on log-log paper. They were (TC+R) versus drainage area, and R versus drainage area.

These curves are shown on figure E6A. They were developed from hydrographs from four streams with Upper Basin characteristics, the Genesee River at Scio, Genesee River at Portageville, Angelica Creek at Angelica, and Canaseraga Creek at Dansville. The unit hydrographs determined for the same streams, by use of the Clark coefficients from figure E6A, were then compared to the unit graphs for those streams as determined by conventional storm studied. The results are shown on figures E7A thru E10A, and were considered good. Then synthetic unit hydrographs were developed, by Clark's method, for all important ungaged tributaries in the Upper Basin. The advantages of the Clark method are that it includes many of the basin characteristics which affect the unit hydrograph; that it determines the unit hydrograph by hydrologic and hydraulic reasoning, starting from basic principles, and eliminating much empiricism; and finally, that the characteristics used, that is TC, R, and the time-area curve, completely define the unit graph as to shape and insure that the volume of the unit graph is automatically one inch, eliminating the trial and error process previously used. Another major advantage is that unit graphs can easily be determined for basins with reservoirs at full pool. Since the area of the pool is assumed to transmit all rain falling on it to the mouth of the basin instantaneously, this effect can be taken care of by plotting a time-area curve for reservoir conditions. This curve will have a non-zero area at lower time values, since the pool shortens the distance traveled by runoff, and hence, the time of travel. Estimates of TC and R are made, to correspond with the changes in storage and time of travel in the basin, and the *Clark unit graph* for the basin with pool conditions is determined by the same method as was previously explained for natural conditions. Its disadvantages are that the time-area curves must be determined by planimetry, the routing computations are tedious, and that the cofficients TC and R must be estimated for ungaged basins much in the same way that Snyder's C_t and C_p are estimated. However, the tedium of routing is eliminated by use of electronic computers, and TC and R, being more basic hydrologic characteristics than C_t and C_p, seem to give better correlations when related to basin parameters. The synthetic unit graphs used for the Upper Basin were derived by use of computer program 23-J2 1223, Unit Hydrograph and Hydrograph Computation, prepared by the Hydrologic Engineering Center and modified in part by the Buffalo District of the Corps of Engineers. As input, this program uses the drainage area, TC, R, the time-area curve, and the desired T_R. The program also computes storm hydrographs if required, and uses the incremental storm rainfall as input. The output from one of these computations is presented as table E28A. The program derived short-duration unit graphs for small basins, and then developed 3-hour unit graphs for each basin, so that the resulting hydrographs would be compatible for routing or combining, or both. Table E28A also shows one storm hydrograph, which was determined by the same program.

TABLE E27A

Computation of Clark Unit Graph

Time: (T=1): hours	I sq.mi.-in.	R = 5.0 xI .182x(2) sq.mi.-in.	(1-x)O_1 .818x(5) sq.mi.-in.	O (3) + (4) sq.mi.-in.	Instantaneous unit graph 645 x (5) c.f.s.	1-hour unit graph ½ (Q_1+Q_2) c.f.s.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	0	0	0	0	0	0
1	4.0	.728	0	.728	470	235
2	13.7	2.493	.596	3.089	1,992	1,231
3	21.6	3.931	2.527	6.458	4,165	3,078
4	18.2	3.312	5.283	8.595	5,544	4,854
5	23.4	4.259	7.031	11.290	7,282	6,413
6	33.1	6.024	9.235	15.259	9,842	8,562
7	29.5	5.369	12.482	17.851	11.514	10,678
8	33.2	6.042	14.602	20.644	13,315	12,414
9	42.7	7.771	16.887	24.658	15,904	14,610
10	29.2	5.314	20.170	25.484	16,437	16,170
11	23.1	4.204	20.846	25.050	16,157	16,297
12	17.8	3.240	20.491	23.731	15,306	15,732
13	7.3	1.329	19.412	20.741	13,378	14,342
14	3.2	.582	16.966	17.548	11,318	12,348
15			14.354	14.354	9,258	10.288
16			etc.	11.742	7,573	8,416
17			(1-x)O_1	ect.	6,195	6,884
18				(1-x)O_1	5,068	5,631
19					4,146	4,606
20					3,391	3,768
21					etc.	3,082
22					(1-x)Q_1	2,521
23						2,062
24						1,687
25						1,380
26						1,129
27						924
28						756
29						618
30						506
						etc. (1-x)O_1

$$O_2 = xI + (1-x)O_1$$

where

$$x = \frac{T}{R + 0.5T} = 0.182$$

$$(1-x) = \frac{R - 0.5T}{R + 0.5T} = 0.818$$

$R = 5.0;\ T = 1$

TABLE E28A Computer output - unit graphs

SUB-BASIN 109 ANGELICA CREEK
NOV. 1950 STORM
GRB

NHT 1 NUHGQ450 NCLRK 18 QRCSN -0.

DA	TR	TP	CP	TC	RTIOR	RTIOL	RCVRY	E	RCLRK
54.00	15.00	-0.00	-0.00	3.50	1.00	-0.00	-0.00	-0.00	2.50
		3.04	0.653	3.50					2.50

UNGR NQ= 60 TR= 15.00 MINS SUMQU= 138642. VOL= 139320.

IUH USING T = 15. MINUTES.

172.	692.	1539.	2730.	4059.	5304.	6475.	7165.	7218.	7087.
7200.	7473.	7398.	7002.	6458.	5843.	5206.	4783.	4327.	3915.
3542.	3205.	2900.	2624.	2374.	2148.	1943.	1758.	1591.	1439.
1302.	1176.	1066.	964.	873.	789.	714.	646.	585.	529.
479.	433.	392.	354.	321.	290.	263.	238.	215.	194.
176.	159.	144.	130.	118.	107.	96.	87.	79.	71.

UH USING TR = 180 MINUTES.

4448.	4774.	1452.	437.	131.	40.	12.	4.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

NP	BASEL	DELTAL	STARTQ	STORM	SPFE	PMF	SHAPF	SIZEF	RCVCF
20	0.020	0.25	55.	-0.00	-0.00	-0.00	-0.000	-0.000	0.000

HR	MIN	RAIN	LOSS	EXCESS	UNIT HG	RECSN	FLOW
0	0				0.	55.	55.
3	0	0.03	0.030	0.00	4448.	55.	55.
6	0	0.10	0.100	0.00	4774.	55.	55.
9	0	0.12	0.120	0.00	1452.	55.	55.
12	0	0.04	0.020	0.02	437.	55.	144.
15	0	0.08	0.020	0.06	131.	55.	417.
18	0	0.36	0.020	0.34	40.	55.	1883.
21	0	0.13	0.020	0.11	12.	55.	2263.
24	0	0.20	0.020	0.18	4.	55.	1903.
27	0	0.18	0.020	0.16	1.	55.	1943.
30	0	0.27	0.020	0.25	0.	55.	2288.
33	0	0.20	0.020	0.18	0.	55.	2389.
36	0	0.19	0.020	0.17	0.	55.	2136.
39	0	0.15	0.020	0.13	0.	55.	1846.
42	0	0.00	0.000	0.00	0.	55.	1043.
45	0	0.00	0.000	0.00	0.	55.	354.
48	0	0.00	0.000	0.00	0.	55.	145.
51	0	0.00	0.000	0.00	0.	55.	82.
54	0	0.00	0.000	0.00	0.	55.	63.
57	0	0.00	0.000	0.00	0.	55.	57.
60	0	0.00	0.000	0.00	0.	55.	56.
63	0				0.	55.	55.
66	0				0.	55.	55.
69	0				0.	55.	55.
72	0				0.	55.	55.
75	0				0.	55.	55.
78	0				0.	55.	55.
81	0				0.	55.	55.
84	0				0.	55.	55.

17A. The following table, E29A lists drainage areas within the Genesee basin as computed by the U. S. Department of the Interior Geological Survey as of February 1967. This table governs over any discrepancies of drainage areas stated in the text.

TABLE E29 A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Ainsworth Brook at mouth	nr. Genesee, Pa.	41 59 44	77 49 01	Genesee, Pa.-N.Y.	.99 a/
Angelica Creek at gaging station	at Transit Bridge, N.Y.	42 17 43	78 03 28	Angelica	83.1
Angelica Creek at mouth	do.	42 17 36	78 04 16	do.	86.4
Bairds Creek at mouth	nr. Piffard, N.Y.	42 50 54	77 52 04	Geneseo	2.06
Baker Creek	nr. Angelica, N.Y.	42 18 30	78 02 35	Angelica	22.4
Baker Creek at mouth	do.	42 18 20	78 02 32	do.	22.5
Beards Creek at highway 36	at Leicester, N.Y.	42 46 30	77 53 50	Leicester	12.9
Beards Creek at highway 20A	at Cuylerville, N.Y.	42 46 36	77 51 38	Geneseo	47.9
Beards Creek at mouth	nr. Cuylerville, N.Y.	42 47 13	77 51 12	do.	49.3
Bebee Creek at South Road	nr. Honeoye, N.Y.	42 51 38	77 32 18	Honeoye	19.5
Bebee Creek at mouth	nr. Honeoye, N.Y.	42 51 19	77 33 06	do.	19.8
Bennett Creek at mouth	at Canaseraga, N.Y.	42 27 26	77 47 01	Canaseraga	4.44
Bidwells Creek at mouth	at Retsof, N.Y.	42 50 34	77 52 33	Leicester	9.07
Bigelow Creek	nr. South Byron, N.Y.	43 02 56	78 05 43	Byron	7.43
Bigelow Creek at mouth	at Byron, N.Y.	42 04 16	78 04 08	do.	8.54
Black Creek at mouth	at Canaseraga, N.Y.	42 28 06	77 46 04	Canaseraga	1.47
Black Creek	at Bennetts, N.Y.	42 19 19	77 56 34	West Almond	30.0
Black Creek at mouth	nr. Bennetts, N.Y.	42 18 17	77 57 34	do.	34.3
Black Creek at gaging station	at Churchville, N.Y.	43 06 02	77 52 57	Churchville	123
Black Creek at highway 305	at Rockville, N.Y.	42 18 08	78 09 47	Black Creek	21.2
Black Creek at mouth	at Belfast, N.Y.	42 19 58	78 06 43	Angelica	30.9
Black Creek	nr. Genesee Junction, N.Y.	43 05 30	77 43 52	Genesee Junction	182
Black Creek at mouth	at Genesee Junction, N.Y.	43 05 50	77 40 44	do.	192
Bradner Creek at highway 36	at Woodsville, N.Y.	42 34 49	77 44 20	Dansville	7.45
Bradner Creek at mouth	nr. Groveland, N.Y.	42 40 33	77 47 45	Sonyea	16.5
Brimmer Brook	nr. Wellsville, N.Y.	42 07 28	77 58 43	Wellsville, South	7.76
Brimmer Brook at mouth	nr. Wellsville, N.Y.	42 08 11	77 58 29	Wellsville, North	8.21
Browns Creek at mouth	nr. Fowlerville, N.Y.	42 52 07	77 50 25	Geneseo	9.43

a/ Includes 0.03 sq mi in Pa.

TABLE E29 A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Buck Run Creek at mouth	nr. Mount Morris, N.Y.	42 43 37	77 50 29	Sonyea	15.0
Bush Brook at mouth	at Pike, N.Y.	42 33 12	78 09 13	Pike	1.50
California Creek at mouth	at Bennetts, N.Y.	42 19 17	77 56 35	West Almond	2.45
Canadice Outlet at Canadice Lake	nr. Canadice Corners, N.Y.	42 44 27	77 34 20	Springwater	12.4
Canadice Outlet at mouth	nr. Hemlock, N.Y.	42 46 50	77 37 06	Honeoye	17.4
Canaseraga Creek	at Rosses, N.Y.	42 31 13	77 53 24	Nunda	5.12
Canaseraga Creek at gaging station	nr. Canaseraga, N.Y.	42 28 18	77 45 24	Canaseraga	58.2
Canaseraga Creek at gaging station	nr. Dansville, N.Y.	42 33 36	77 42 57	Dansville	153
Canaseraga Creek at gaging station	at Groveland, N.Y.	42 39 43	77 46 08	Sonyea	181
Canaseraga Creek at gaging station	at Shakers Crossing, N.Y.	42 44 13	77 50 26	do.	333
Canaseraga Creek at mouth	nr. Mount Morris, N.Y.	42 45 17	77 50 28	Geneseo	335
Caneadea Creek	at Rushford, N.Y.	42 22 57	78 15 15	Freedom	26.2
Caneadea Creek above Rushford Lake	nr. Caneadea, N.Y.	42 22 56	78 13 31	Houghton	43.9
Caneadea Creek at gaging station	at Caneadea, N.Y.	42 23 14	78 09 45	do.	62.0
Caneadea Creek at mouth	do.	42 22 58	78 09 13	do.	62.7
Caneadea Creek Trib.	at Rusford, N.Y.	42 23 52	78 15 22	Freedom	5.59
Cascade Brook at mouth	at Wyoming, N.Y.	42 49 12	78 05 15	Wyoming	.74
Chenunda Creek	at Stannards, N.Y.	42 05 06	77 54 36	Wellsville, South	30.3
Chenunda Creek at mouth	at Stannards, N.Y.	42 05 21	77 56 05	do.	31.0
Christie Creek at Batzing Rd.	nr. Canawaugus, N.Y.	42 54 40	77 47 19	Caledonia	14.5
Christie Creek at mouth	do.	42 54 39	77 47 06	do.	15.0
Cold Creek	at Hume, N.Y.	42 28 23	78 08 12	Houghton	40.6
Cold Creek at mouth	at Fillmore, N.Y.	42 27 49	78 06 33	Fillmore	42.0
Conesus Creek at Conesus Lake Outlet	at Lakeville, N.Y.	42 50 04	77 42 17	Livonia	69.7
Conesus Creek at highway 20A	at Lakeville, N.Y.	42 50 10	77 42 22	do.	69.8
Conesus Creek	at Millville, N.Y.	42 51 13	77 42 57	do.	71.9
Conesus Creek at highway 39	at Ashantee, N.Y.	42 53 51	77 45 51	Caledonia	79.0
Conesus Creek at mouth	at Avon, N.Y.	42 54 46	77 46 02	do.	91.8

TABLE E29 A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Conesus Inlet	at Scottsburg, N.Y.	42 40 08	77 42 47	Conesus	4.19
Conesus Inlet at mouth	nr. Conesus, N.Y.	42 43 24	77 42 52	do.	28.7
Cooley Creek at mouth	at Withey, N.Y.	42 14 35	77 59 31	Wellsville, North	.71
Cotton Brook at mouth	at Hickox, Pa.	41 58 28	77 51 08	Genesee, Pa.-N.Y.	2.54 b/
Crawford Creek at Crawford Creek Rd.	at Oramel, N.Y.	42 21 37	78 08 58	Black Creek	9.77
Crawford Creek at mouth	at Oramel, N.Y.	42 22 28	78 08 29	Black Creek	10.9
Crowner Brook at mouth	at Wellsville, N.Y.	42 07 46	77 57 44	Wellsville, North	3.99
Cryder Creek	at Paynesville, N.Y.	42 00 28	77 50 31	Whitesville	47.7 c/
Cryder Creek at mouth	at Genesee, Pa.	41 59 50	77 52 09	Genesee, Pa.-N.Y.	50.1 d/
Dry Brook at mouth	at Scio, N.Y.	42 10 53	77 59 18	Wellsville, North	3.50
Dugan Creek	at Maxwell, N.Y.	42 58 25	77 46 22	Caledonia	3.63
Dugan Creek at mouth	at Golah, N.Y.	42 58 17	77 43 30	Rush	6.40
Dunns Brook at mouth e/	nr. Dalton, N.Y.	42 32 30	77 55 09	Nunda	1.85
Dyke Creek	nr. West Greenwood, N.Y.	42 08 42	77 44 07	Greenwood	1.80
Dyke Creek at highway 17	nr. Andover, N.Y.	42 08 51	77 49 19	Andover	37.8
Dyke Creek at gaging station	at Wellsville, N.Y.	42 07 13	77 56 14	Wellsville, South	71.9
Dyke Creek at mouth	do.	42 07 08	77 56 48	do.	72.4
East Koy Creek	at Hermitage, N.Y.	42 38 55	78 11 50	Warsaw	18.0
East Koy Creek at highway 19	at Gainesville, N.Y.	42 38 21	78 08 04	do.	27.7
East Koy Creek at highway 39	at Lamont, N.Y.	42 35 29	78 06 21	Portageville	35.5
East Koy Creek at gaging station	at East Koy, N.Y.	42 32 27	78 05 54	do.	46.2
East Koy Creek at mouth	at Wiscoy, N.Y.	42 30 42	78 05 39	do.	48.6
Eastover Brook at mouth	nr. Ridge, N.Y.	42 40 00	77 57 26	Mount Morris	1.13
East Valley Creek at mouth	at Andover, N.Y.	42 09 13	77 48 29	Andover	15.9
Ellisburg Creek at mouth	at Ellisburg, Pa.	41 55 47	77 53 44	Genesee, Pa.-N.Y.	2.96 b/

b/ Entirely in Pa.
c/ Includes 3.99 sq mi in Pa.
d/ Includes 4.29 sq mi in Pa.
e/ From NYS Dept. of Health, Genesee River Report No. 2.

TABLE E29 A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Genesee River above Wolf Creek	nr. Five Corners, N.Y.	42 37 16	77 59 17	Nunda	1,012
Do. above dam	at Mount Morris, N.Y.	42 44 18	77 52 56	Mount Morris	1,073
Do. at Jones Bridge gaging station	nr. Mount Morris, N.Y.	42 46 00	77 50 21	Geneseo	1,414
Do. at gaging station	at Avon, N.Y.	42 55 04	77 45 27	Caledonia	1,663
Do. at Ballantyne Bridge	nr. Mortimer, N.Y.	43 05 31	77 40 52	Genesee Junction	2,203
Do. at Elmwood Ave.	at Rochester, N.Y.	43 07 28	77 37 58	do.	2,443 k/
Do. at Driving Park Ave. at gaging station	at Rochester, N.Y.	43 10 50	77 37 40	Rochester, West	2,453 l/
Do. at mouth at R.R. bridge	at Rochester, N.Y.	43 15 12	77 36 29	Rochester, East	2,466
Gordon Brook	at Scio, N.Y.	42 10 45	77 59 38	Wellsville, North	7.69
Do. at mouth	nr. Scio, N.Y.	42 11 24	77 59 51	do.	8.03
Guthrie Creek at mouth e/	at Mumford, N.Y.	42 59 52	77 51 15	Caledonia	1.05
Hemlock Lake	at lake outlet	42 46 38	77 36 58	Honeoye	43.6
Hemlock Outlet at mouth	nr. Honeoye, N.Y.	42 50 07	77 31 58	do.	78.0
Hog Brook at mouth	at Allentown, N.Y.	42 05 23	78 03 27	Allentown, N.Y.-Pa.	1.91
Honeoye Creek at lake outlet	at Honeoye, N.Y.	42 46 59	77 30 46	Honeoye	41.1
Do. above Mill Creek	at Honeoye, N.Y.	42 47 20	77 30 54	do.	42.0
Do. at gaging station	at Honeoye Falls, N.Y.	42 57 24	77 35 21	Honeoye Falls	195
Do. at mouth	nr. West Rush, N.Y.	42 58 17	77 43 07	Rush	266
Do. Trib. on Rush Rd.	nr. Rush, N.Y.	42 59 09	77 39 55	Rush	15.7
Do. Trib. at mouth	nr. Rush, N.Y.	42 59 12	77 40 09	Rush	15.7
Honeoye Inlet at mouth	nr. Canadice Corners, N.Y.	42 43 13	77 30 40	Springwater	17.6
Hotel Creek	nr. Churchville, N.Y.	43 05 08	77 51 43	Clifton	5.84
Hotel Creek at mouth	do.	43 05 18	77 51 06	do.	6.33
Houghton Creek at mouth e/	at Houghton, N.Y.	42 25 48	78 08 39	Houghton	5.83

e/ From N.Y.S. Dept. of Health, Genesee River Report No. 2.
k/ During canal operating season the flow at this site includes approximately 375 cfs diverted from the Lake Erie basin via Barge Canal.
l/ Does not include 6.85 sq mi noncontributing canal drainage.

TABLE E29 A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Elm Creek at mouth	nr. Hume, N.Y.	42 30 14	78 09 23	Pike	2.45
East Valley Creek Tributary	nr. Andover, N.Y.	42 11 21	77 46 02	Andover	1.46
East Valley Creek Tributary at mouth	nr. Andover, N.Y.	42 11 16	77 46 18	do.	1.52
Elm Valley Creek f/	nr. Elm Valley, N.Y.	42 11 17	77 51 01	Andover	4.87
Elm Valley Creek f/	nr. Andover, N.Y.	42 10 17	77 51 17	Andover	7.05
Elm Valley Creek at mouth f/	at Elm Valley, N.Y.	42 08 46	77 52 33	Wellsville, North	11.1
Emery Brook at mouth	at Pike, N.Y.	42 33 10	78 09 12	Pike	.45
Ewart Creek	at Swain, N.Y.	42 28 39	77 51 17	Canaseraga	3.83
Ewart Creek at mouth	at Swain, N.Y.	42 28 58	77 51 21	do.	3.91
Fall Brook at mouth	nr. Geneseo, N.Y.	42 46 47	77 50 26	Geneseo	4.71
Feathers Creek at mouth	nr. Belmont, N.Y.	42 14 15	78 01 01	Belmont	4.01
Ford Brook	at Stannards, N.Y.	42 04 04	77 55 43	Wellsville, South	11.5
Ford Brook at mouth	at Stannards, N.Y.	42 03 55	77 55 30	do.	11.5
Fry Creek at mouth	nr. Birdsall, N.Y.	42 25 41	77 55 42	Birdsall	3.03
Genesee River	at Hickox, Pa.	41 58 32	77 51 23	Genesee, Pa.-N.Y.	38.1 b/
Do.	at Genesee, Pa.	41 59 40	77 52 13	do.	85.4 g/
Do. at New York State line	at Genesee, Pa.	41 59 54	77 52 14	do.	136 h/
Do.	at Wellsville, N.Y.	42 07 20	77 57 00	Wellsville	289 j/
Do. at gaging station	at Scio, N.Y.	42 09 50	77 58 50	do.	308
Do. at gaging station	at Belfast, N.Y.	42 20 35	78 06 11	Angelica	638
Do. above Wiscoy Creek	at Rossburg, N.Y.	42 29 54	78 03 24	Fillmore	849
Do. at gaging station	at Portageville, N.Y.	42 34 12	78 02 46	Portageville	977
Do. above Wolf Creek	nr. do.	42 36 44	78 00 36	do.	991

b/ Entirely in Pa.
f/ Local name.
g/ Includes 84.3 sq mi in Pa.
h/ Includes 88.6 sq mi in Pa.
j/ Includes 95.5 sq mi in Pa.

TABLE E29A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Indian Creek at mouth	nr. Andover	42 08 46	77 49 19	Andover	2.35
Irish Settlement Brook at mouth	at Genesee, Pa.	41 59 00	77 52 34	Genesee, Pa.-N.Y.	3.45 b/
Jaycox Creek at Nations Rd.	nr. Geneseo, N.Y.	42 50 06	77 48 44	Geneseo	14.1
Do. at mouth	do.	42 50 03	77 50 13	do.	14.7
Jess Brook e/	nr. Springwater, N.Y.	42 38 48	77 34 46	Springwater	.34
Jess Brook at mouth e/	at Springwater, N.Y.	42 38 45	77 35 51	do.	.50
Kelly Brook at mouth	at Pearl Creek, N.Y.	42 51 15	78 03 48	Wyoming	.71
Keshequa Creek	at Sonyea, N.Y.	42 40 53	77 49 45	Sonyea	68.8
Keshequa Creek at mouth	nr. Sonyea, N.Y.	42 42 55	77 49 53	do.	69.5
Kinney Creek at mouth	at Hemlock, N.Y.	42 47 33	77 36 53	Honeoye	6.93
Knight Creek	at Scio, N.Y.	42 10 15	77 59 18	Wellsville, North	21.9
Knight Creek at mouth	do.	42 10 29	77 59 16	do.	22.0
Lacy Creek at mouth	nr. Perry, N.Y.	42 42 43	77 57 46	Mount Morris	3.81
Limekiln Creek e/	at Springwater, N.Y.	42 37 49	77 35 47	Springwater	3.82
Limekiln Creek at mouth e/	do.	42 38 54	77 35 57	do.	6.12
Little Beards Creek at mouth	at Leicester, N.Y.	42 46 28	77 53 25	Leicester	25.9
Little Black Creek at mouth	at Genesee Junction, N.Y.	43 06 24	77 40 36	Genesee Junction	22.1
Little Conesus Creek at mouth	at Avon, N.Y.	42 54 05	77 46 02	Caledonia	12.1
Little Mill Creek at reservoir outlet	nr. Dansville, N.Y.	42 34 05	77 38 32	Dansville	7.54
Little Mill Creek at mouth	at Dansville, N.Y.	42 32 47	77 40 57	do.	13.3
Long Gore Creek at mouth	nr. Belmont, N.Y.	42 12 23	78 01 24	Belmont	3.19
Ludington Run at mouth	at West Bingham, Pa.	41 56 23	77 48 45	Genesee, Pa.-N.Y.	11.5 b/
Mad Creek at mouth	nr. Limerock, N.Y.	42 59 56	77 55 02	LeRoy	14.3
Marsh Creek	at Mapes, N.Y.	42 02 55	77 55 53	Wellsville, South	12.2 m/
Marsh Creek at mouth	do.	42 03 04	77 55 47	do.	12.5
Marsh Creek Tributary	do.	42 02 42	77 56 12	do.	1.03
Marsh Creek below Railroad Bridge	at Andover, N.Y.	42 09 40	77 47 33	do.	12.8
Marsh Creek at mouth	at Andover, N.Y.	42 09 05	77 48 30	do.	15.4

b/ Entirely in Pa. e/ From N.Y.S. Dept. of Health, Genesee River Rept.# 2. m/ Includes 4.79 sq mi in Pa.

TABLE E29A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Marsh Creek Trib. at mouth	nr. Andover, N.Y.	42 11 19	77 46 13	Wellsville, South	1.59
Marsh Creek at mouth	at Whitesville, N.Y.	42 02 27	77 46 03	Whitesville	15.2
Middle Branch Genesee River at mouth	at Hickox, Pa.	41 58 34	77 51 25	Genesee, Pa.-N.Y.	16.6 b/
Mill Brook at mouth	nr. South Byron, N.Y.	43 03 43	78 07 10	Byron	4.20
Mill Creek	at Patchinville, N.Y.	42 31 13	77 35 06	Wayland	4.23
Do.	at Perkinsville, N.Y.	42 32 16	77 37 35	Dansville	18.1
Mill Creek above Little Mill Creek	at Dansville, N.Y.	42 32 47	77 40 57	do.	22.3
Mill Creek below Little Mill Creek	do.	42 32 47	77 40 57	do.	35.6
Mill Creek at highway 36	do.	42 33 15	77 42 04	do.	36.0
Mill Creek at mouth	do.	42 33 13	77 42 34	do.	36.0
Mill Creek at East Lake Road	at Honeoye Park, N.Y.	42 47 09	77 29 57	Bristol Center	12.7
Mill Creek at mouth	at Honeoye, N.Y.	42 47 20	77 30 54	Honeoye	12.8
Mill Creek	nr. West Chili, N.Y.	43 04 31	77 46 56	Clifton	14.0
Mill Creek at mouth	nr. Chili Center, N.Y.	43 05 17	77 45 36	do.	14.7
Moss Brook at mouth	at Friendship, N.Y.	42 12 21	78 07 44	Friendship	3.70
Mud Creek at highway 256	at Dansville, N.Y.	42 33 50	77 41 40	Dansville	1.44
Mud Creek at mouth	at White Bridge, N.Y.	42 36 21	77 43 45	do.	9.87
Mundy Brook at mouth	at Hickox, Pa.	41 58 57	77 51 40	Genesee, Pa.-N.Y.	5.89 m/
Newville Creek	nr. Barkertown, N.Y.	42 33 25	77 55 31	Nunda	5.15
Newville Creek at mouth	at Nunda, N.Y.	42 34 50	77 55 38	do.	8.34
North Br. Black Creek at mouth	nr. North Bergen, N.Y.	43 06 33	77 59 43	Churchville	7.56
North Br. Phillips Creek at mouth	at Withey, N.Y.	42 14 39	77 59 17	Wellsville, North.	7.16
North Br. Van Campen Creek at mouth	at Friendship, N.Y.	42 12 16	78 08 19	Friendship	6.81
North Fork Jaycox Creek at mouth	nr. Geneseo, N.Y.	42 50 06	77 46 34	Geneseo	4.68
North McMillan Creek at mouth	nr. Conesus, N.Y.	42 43 39	77 42 34	Conesus	7.80
Oatka Creek at gaging station	at Warsaw, N.Y.	42 44 39	78 08 16	Warsaw	41.9
Oatka Creek at highway 19	at Pearl Creek, N.Y.	42 50 54	78 03 38	Wyoming	80.4
Oatka Creek	nr. Roanoke, N.Y.	42 57 25	78 01 31	Stafford	125

b/ Entirely in Pa. m/ Includes 4.79 sq mi in Pa.

TABLE E29A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Oatka Creek	nr. Limerock, N.Y.	43 00 05	77 55 17	Churchville	165
Oatka Creek at gaging station	at.Garbutt, N.Y.	43 00 36	77 47 30	Clifton	204
Oatka Creek at mouth	at Scottsville, N.Y.	43 01 25	77 43 49	Genesee Junction	215
Oatka Creek Trib. at highway 19	at South Warsaw, N.Y.	42 43 04	78 07 58	Warsaw	.84
Oatka Creek Trib. at mouth	do.	42 43 07	78 07 44	do.	.86
Orebed Creek at mouth	at Stone Dam, N.Y.	42 02 07	77 56 21	Wellsville, South	4.37 n/
Pearl Creek at highway 19	at Pearl Creek, N.Y.	42 50 54	78 02 37	Wyoming	10.9
Pearl Creek at mouth	at Pearl Creek, N.Y.	42 51 10	78 03 41	do.	11.2
Phillips Creek	nr. Belmont, N.Y.	42 14 19	78 00 56	Belmont	26.0
Phillips Creek at mouth	at Belmont, N.Y.	42 12 33	78 02 00	do.	30.7
Plum Bottom Creek at mouth	at Belmont, N.Y.	42 13 28	78 01 49	do.	7.51
Put Brook at mouth	nr. Scio, N.Y.	42 10 41	77 54 57	Wellsville, North	.45
Quig Hollow Brook	nr. Andover, N.Y.	42 08 44	77 45 26	Andover	4.20
Quig Hollow Brook at mouth f/	do.	42 08 49	77 45 31	do.	4.23
Railroad Brook	nr. Alfred, N.Y.	42 12 52	77 47 49	Andover	.96
Railroad Brook at mouth	at Andover, N.Y.	42 09 40	77 47 36	do.	5.70
Red Brook at mouth	nr. Wyoming, N.Y.	42 48 10	78 06 06	Wyoming	.92
Red Creek	nr. Rochester, N.Y.	43 05 32	77 39 08	Genesee Junction	16.2
Red Creek at mouth at canal	nr. Rochester, N.Y.	43 07 11	77 38 23	do.	22.6
Redwater Creek	at Stone Dam, N.Y.	42 01 51	77 56 29	Wellsville, South	6.07 p/
Redwater Creek at mouth	at Stone Dam, N.Y.	42 02 07	77 56 21	Wellsville, South	6.16
Relyea Creek at mouth	nr. Warsaw, N.Y.	42 42 47	78 07 43	Warsaw	4.63
Robins Brook at mouth	at Jericon Corners	43 06 02	77 58 31	Churchville	7.10
Rock Bottom Creek at mouth e/	at Hardy Corners, N.Y.	42 22 03	78 17 51	Rawson	2.65

e/ From N.Y.S. Dept. of Health, Genesee River Report No. 2.
f/ Local name.
n/ Includes 2.78 sq mi in Pa.
p/ Includes 2.01 sq mi in Pa.

TABLE E29A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quandrangle	Drainage area sq mi
Rose Brook at mouth	nr. Wileyville, N.Y.	42 01 24	77 43 43	Rexville	4.14 r/
Rose Lake Run at mouth	at Ellisburg, Pa.	41 55 50	77 53 43	Genesee, Pa.-N.Y.	6.88 b/
Rush Creek #2 at mouth	at McGrawville, N.Y.	42 21 33	78 12 16	Black Creek	10.7
Rush Creek	nr. Fillmore, N.Y.	42 26 42	78 04 50	Fillmore	37.0
Rush Creek at Ballard Rd.	at Fillmore, N.Y.	42 27 52	78 05 44	do.	41.2
Rush Creek at mouth	at Fillmore, N.Y.	42 28 10	78 05 43	do.	41.2
Rushford Lake at dam	nr. Caneadea, N.Y.	42 22 49	78 11 00	Houghton	61.1
Salt Creek at mouth	nr. Piffard, N.Y.	42 50 57	77 50 07	Geneseo	12.8
Shongo Creek at mouth	at Houghton, N.Y.	42 25 02	77 08 44	Houghton	4.77
Silver Lake Inlet at mouth	at Perry, N.Y.	42 42 55	78 01 32	Castile	10.0
Silver Lake at Lake Outlet	at Perry, N.Y.	42 42 59	78 01 10	do.	17.3
Silver Lake Outlet	nr. Ridge, N.Y.	42 42 05	77 56 18	Mount Morris	24.8
Silver Lake Outlet at mouth	nr Mount Morris, N.Y.	42 42 50	77 55 07	do.	31.1
Sixtown Creek	at Hume, N.Y.	42 28 53	78 08 54	Houghton	23.4
Sixtown Creek at mouth	do.	42 28 52	78 08 39	do.	23.6
Slader Creek at mouth	at Canaseraga, N.Y.	42 27 27	77 46 54	Canaseraga	15.2
Snowball Hollow Creek at mouth	nr Scio, N.Y.	42 08 53	78 00 23	Belmont	3.49
South Branch Ford Brook at mouth	nr Stannards, N.Y.	42 04 11	77 56 49	Wellsville, South	5.91
South Br. Van Campen Cr. at mouth	at Friendship, N.Y.	42 12 11	78 08 26	Friendship	25.5
South Fork Jaycox Creek at mouth	nr. Geneseo, N.Y.	42 50 06	77 46 34	Geneseo	3.92
South McMillan Creek at mouth	nr. Conesus, N.Y.	42 42 53	77 42 43	Conesus	10.6
Sponable Creek f/	nr. South Dansville, N. Y.	42 30 04	77 37 58	Dansville	.69
Sponable Creek at mouth f/	at Rogersville, N.Y.	42 30 11	77 40 48	do.	2.79
Spring Brook at mouth	at Pike, N.Y.	42 33 58	78 09 57	Pike	1.01
Spring Brook on Honeoye Falls Rd.	at Moran Corner, N.Y.	42 57 36	77 37 11	Honeoye Falls	22.7
Spring Brook at mouth	at Moran Corner, N.Y.	42 57 44	77 36 54	do.	22.8
Spring Creek at B.&O. Railroad e/	at Mumford, N.Y.	42 59 13	77 51 42	Caledonia	3.91
Spring Creek at mouth e/	at Mumford, N.Y.	42 59 40	77 51 52	do.	4.19

b/ Entirely in Pa.
f/ Local name.
e/ From N.Y.S. Dept. of Health, Genesee River Report No. 2.
r/ Includes 1.44 sq mi in Pa.

TABLE E29A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Spring Creek	at Pumpkin Hill, N.Y.	43 05 37	78 04 00	Byron	21.6
Spring Creek at mouth	nr. Byron, N.Y.	43 05 56	78 02 50	do.	22.4
Spring Mills Creek at mouth	at Whitesville, N.Y.	42 02 27	77 46 03	Whitesville	19.1 s/
Springwater Creek	nr. Wayland, N.Y.	42 36 40	77 36 02	Wayland	1.95
Springwater Creek at gaging station	at Springwater, N.Y.	42 38 37	77 36 12	Springwater	10.1
Springwater Creek at mouth	nr. Springwater, N.Y.	42 40 05	77 35 04	do.	21.2
State Ditch at mouth	nr. Sonyea, N.Y.	42 41 04	77 47 54	Sonyea	40.9
Stony Brook	at South Dansville, N.Y.	42 28 14	77 39 10	Hornell	2.23
Stony Brook above Sponable Creek	at Rogersville, N.Y.	42 30 11	77 40 48	Dansville	15.2
Stony Brook below Sponable Creek	at Rogersville, N.Y.	42 30 11	77 40 48	do.	13.0
Stony Brook at highway 36	nr. Dansville, N.Y.	42 31 38	77 41 45	do.	21.0
Stony Brook at mouth	at Dansville, N.Y.	42 32 31	77 42 02	do.	22.6
Stony Creek	at Warsaw, N.Y.	42 44 00	78 08 15	Warsaw	9.12
Stony Creek at mouth	at Warsaw, N.Y.	42 44 16	78 08 02	do.	9.16
Sucker Brook at mouth	at Sucker Brook, N.Y.	42 44 27	78 01 54	Castile	3.64
Sugar Creek	at Westview, N.Y.	42 33 07	77 49 38	Ossian	5.38
Sugar Creek at Linzy Rd.	nr. Ossian, N.Y.	42 30 52	77 48 12	do.	9.83
Sugar Creek	at Ossian, N.Y.	42 31 02	77 47 09	do.	13.4
Sugar Creek at mouth	nr. Moraine, N.Y.	42 29 10	77 43 56	Hornell	20.3
Thornel Brook at mouth e/	nr. South Byron, N.Y.	43 00 54	78 06 59	Byron	.92
Trapping Brook at mouth	nr. Wellsville, N.Y.	42 07 43	77 55 12	Wellsville, North	5.25
Trout Brook at mouth	at Pike Corners, N.Y.	42 34 16	78 10 20	Pike	14.9
Turner Creek at mouth	at West Bingham, Pa.	41 56 40	77 49 02	Genesee, Pa.-N.Y.	7.95 b/
Twomile Creek at mouth	at Groveland, N.Y.	42 40 05	77 47 39	Sonyea	6.91
Van Campen Creek at gaging station	at Friendship, N.Y.	42 12 23	78 07 44	Friendship	45.8
Van Campen Creek at mouth	at Belvidere, N.Y.	42 15 09	78 03 05	Angelica	56.8
Vandermark Creek	nr. White School, N.Y.	42 12 09	77 53 20	Wellsville, North	11.3
Vandermark Creek	nr. Scio, N.Y.	42 10 02	77 57 30	do.	22.0

b/ Entirely in Pa.
e/ From N.Y.S. Dept. of Health, Genesee River Report No. 2.
s/ Includes 3.99 sq mi in Pa.

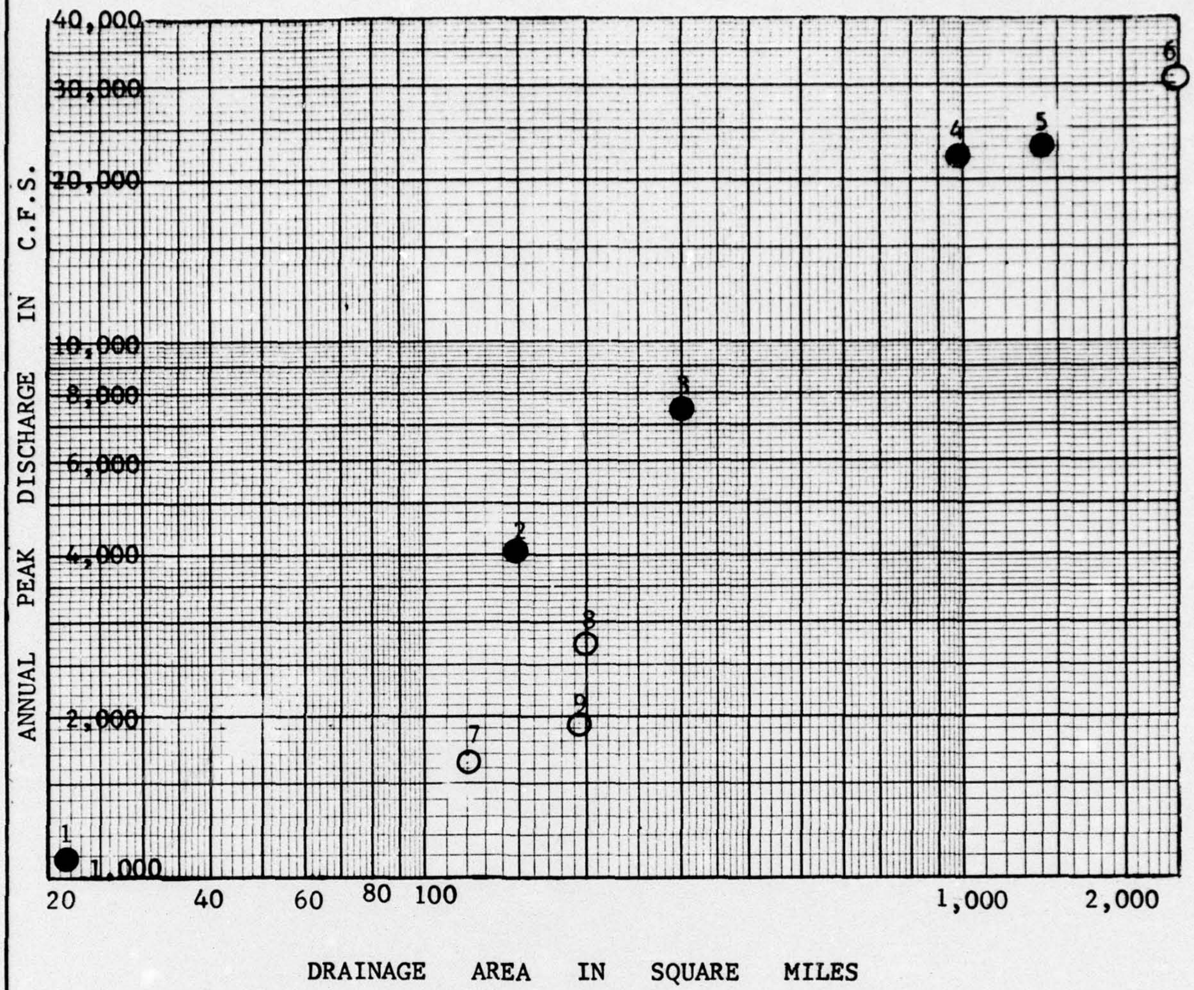
TABLE E29A

GENESEE RIVER, NEW YORK

DRAINAGE AREA DATA (Continued)

Stream	Site	Latitude	Longitude	Quadrangle	Drainage area sq mi
Vandermark Creek at mouth	at Scio, N.Y.	42 10 09	77 58 48	Wellsville, North	22.7
Village Brook at mouth	at Wyoming, N.Y.	42 49 20	78 04 55	Wyoming	1.81
Wahl Brook at mouth	nr. Scio, N.Y.	42 10 55	77 54 27	Wellsville, North	2.24
Warner Creek	nr. Rock Glen, N.Y.	42 41 04	78 06 04	Castile	7.14
Warner Creek at mouth	at Rock Glen, N.Y.	42 40 57	78 06 52	do.	8.46
West Branch Genesee River at mouth	at Genesee, Pa.	41 59 32	77 52 09	Genesee, Pa.-N.Y.	23.7 b/
West Branch Van Campen Creek at mouth	at Friendship, N.Y.	42 12 11	78 08 26	Friendship	8.91
Whetstone Brook at mouth	at Richmond Center, N.Y.	42 49 02	77 31 16	Honeoye	2.57
White Creek	nr. Belfast, N.Y.	42 18 53	78 06 26	Angelica	14.2
White Creek at mouth	at Belfast, N.Y.	42 19 44	78 06 28	do.	15.1
White Creek	at Canawaugua, N.Y.	42 55 53	77 46 51	Caledonia	5.69
White Creek at mouth	at Canawaugus, N.Y.	42 56 02	77 46 23	do.	5.76
White Creek at mouth	at Roanoke, N.Y.	42 56 35	78 02 55	Stafford	9.07
Wigwam Creek at Belfast Rd.	at Belfast, N.Y.	42 20 04	78 05 54	Angelica	11.2
Wigwam Creek at mouth	at Belfast, N.Y.	42 20 07	78 06 15	do.	11.9
Wileyville Creek at mouth	at Whitesville, N.Y.	42 01 56	77 45 13	Whitesville	10.5 c/
Wilkins Creek	at Tuxedo Park, N.Y.	42 49 22	77 41 36	Livonia	2.05
Wilkins Creek at mouth	at Tuxedo Park, N.Y.	42 49 27	77 41 51	do.	2.07
Wiscoy Creek	at Bliss, N.Y.	42 34 59	78 14 17	Pike	20.4
Wiscoy Creek at highway 39	at Pike, N.Y.	42 33 19	78 09 16	Pike	43.6
Wiscoy Creek	at Mills Mills, N.Y.	42 30 04	78 07 11	Portageville	54.3
Wiscoy Creek	at Rossburg, N.Y.	42 30 00	78 04 05	Fillmore	108
Wiscoy Creek at mouth	at Rossburg, N.Y.	42 29 55	78 03 25	do.	109
Wolf Creek	nr. Castile, N.Y.	42 36 55	78 00 45	Portageville	15.8
Wolf Creek at mouth	nr. Castile, N.Y.	42 36 44	78 00 36	do.	15.8

b/ Entirely in Pa.
c/ Includes 3.99 sq mi in Pa.



1. LITTLE TONAWANDA CR. AT LINDEN
2. CANASERAGA CR. AT DANSVILLE
3. GENESEE RIVER AT SCIO
4. GENESEE RIVER AT PORTAGEVILLE
*5. GENESEE RIVER NEAR JONES BRIDGE
*6. GENESEE RIVER AT ROCHESTER
7. BLACK CR. AT CHURCHVILLE
8. OATKA CR. AT GARBUTT
9. HONEOYE CR. AT HONEOYE FALLS

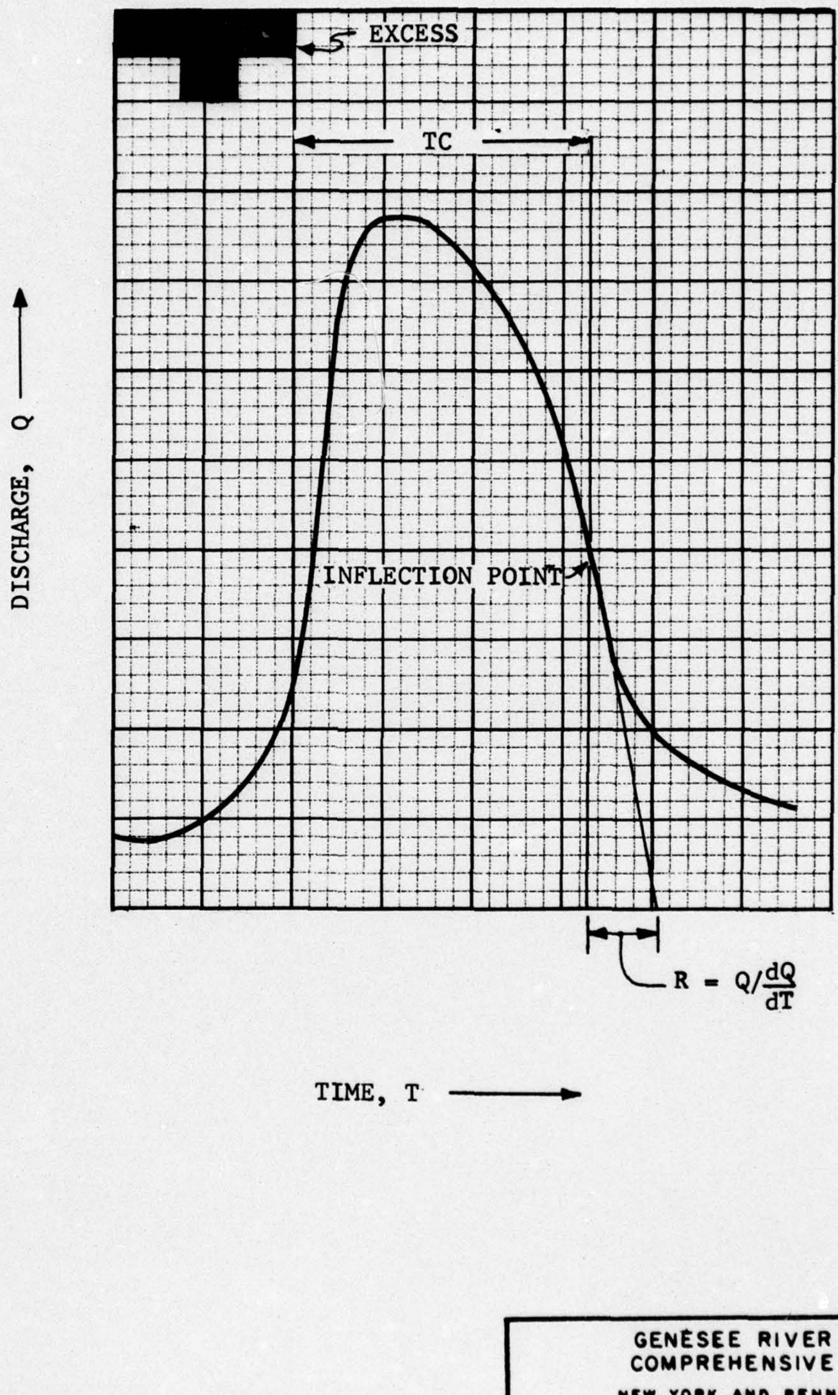
* FLOWS FOR THESE STATIONS DO NOT INCLUDE EFFECTS OF MOUNT MORRIS DAM

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

Qm VERSUS
DRAINAGE AREA

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E1A



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

CLARK'S COEFFICIENTS

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E2A

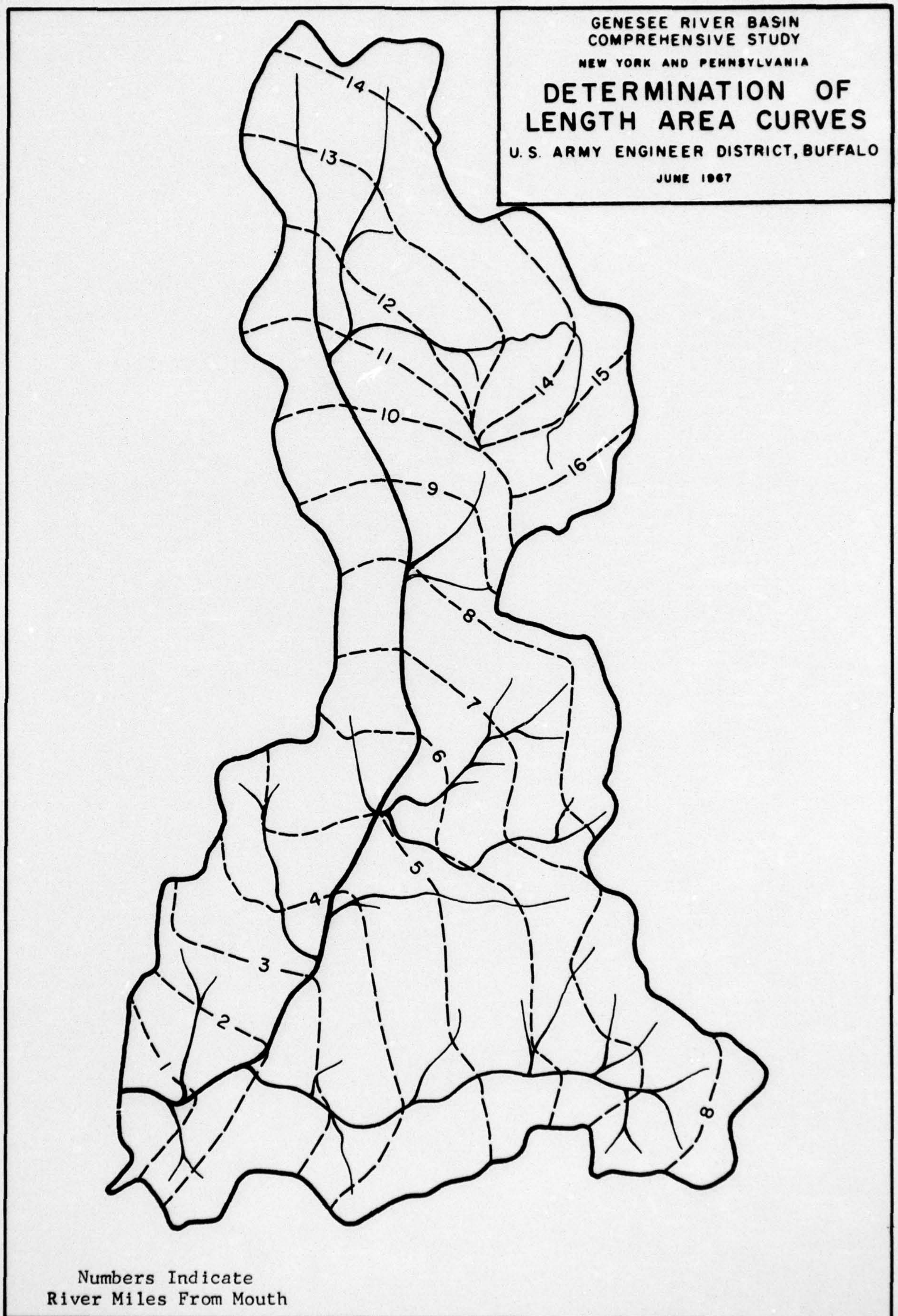
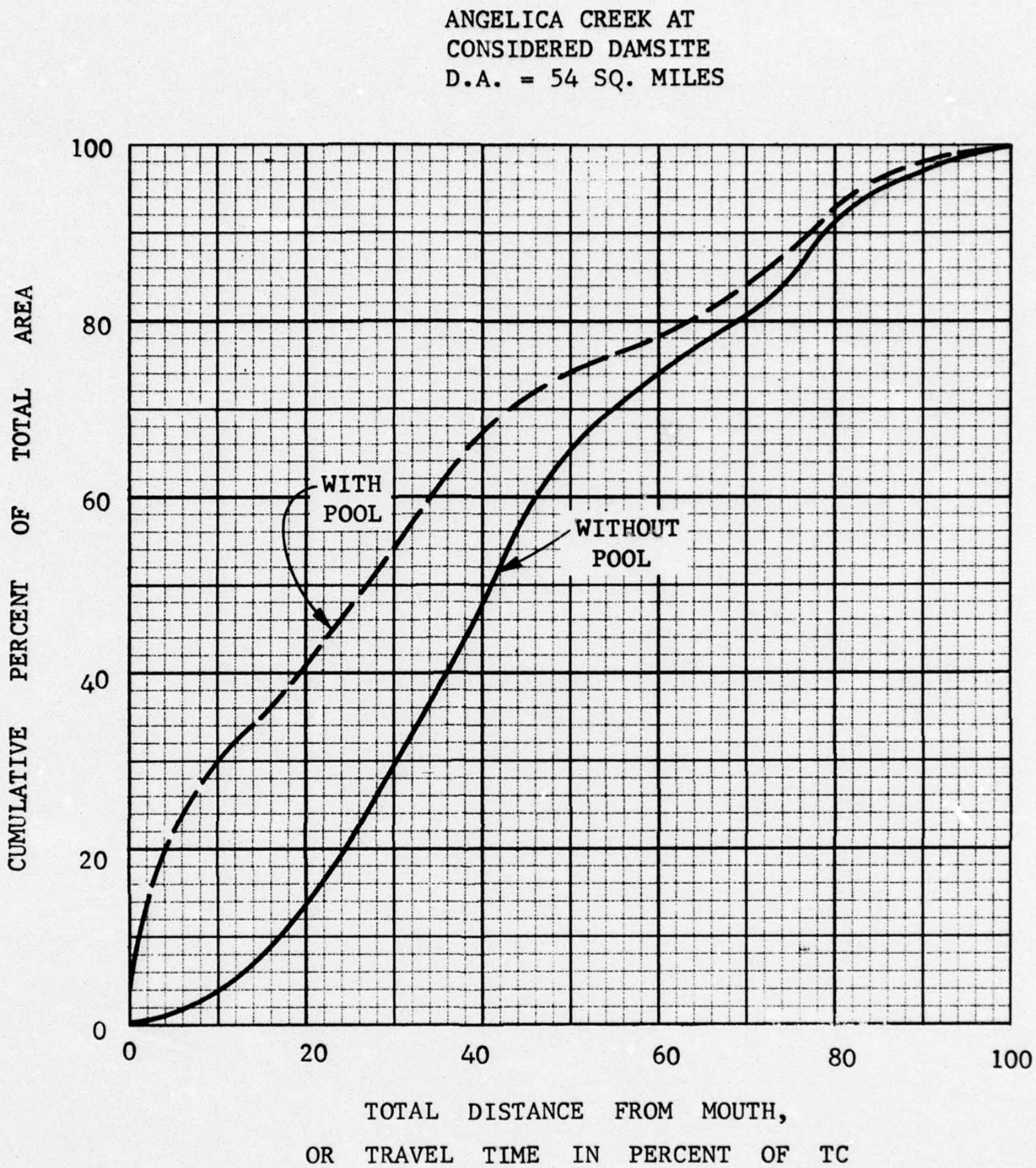

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
DETERMINATION OF
LENGTH AREA CURVES
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967
14
13
12
11
10
9
8
7
6
5
4
3
2
1
14
15
16
8
Numbers Indicate
River Miles From Mouth

FIGURE E3A



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

LENGTH — AREA CURVES

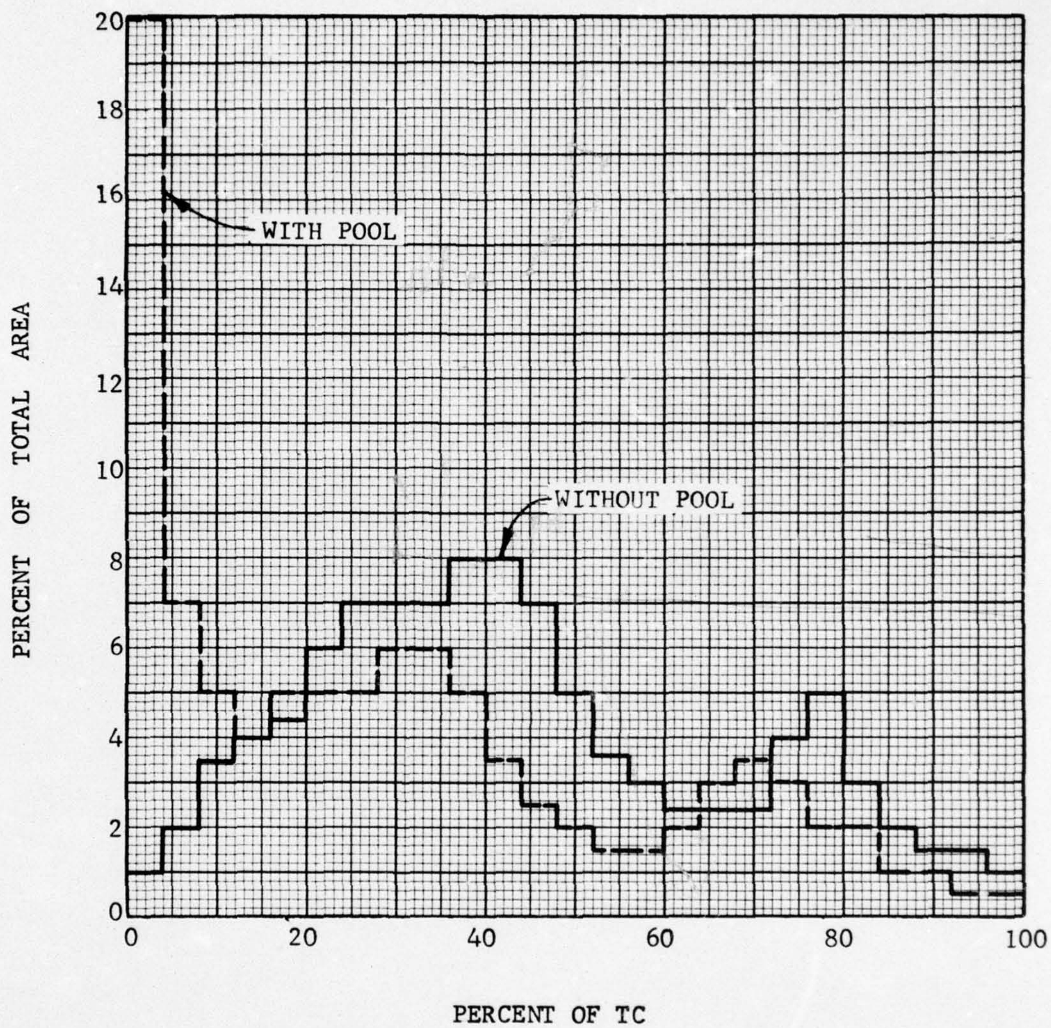
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E4A

INCREMENTAL TIME-AREA CURVES

ANGELICA CREEK AT CONSIDERED DAMSITE

D. A. = 54 SQ. MI.



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

INCREMENTAL
TIME-AREA CURVES

U. S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E5A

AD-A041 705 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 8/6
GENESEE RIVER BASIN COMPREHENSIVE STUDY OF WATER AND RELATED LA--ETC(U)
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3 OF 4
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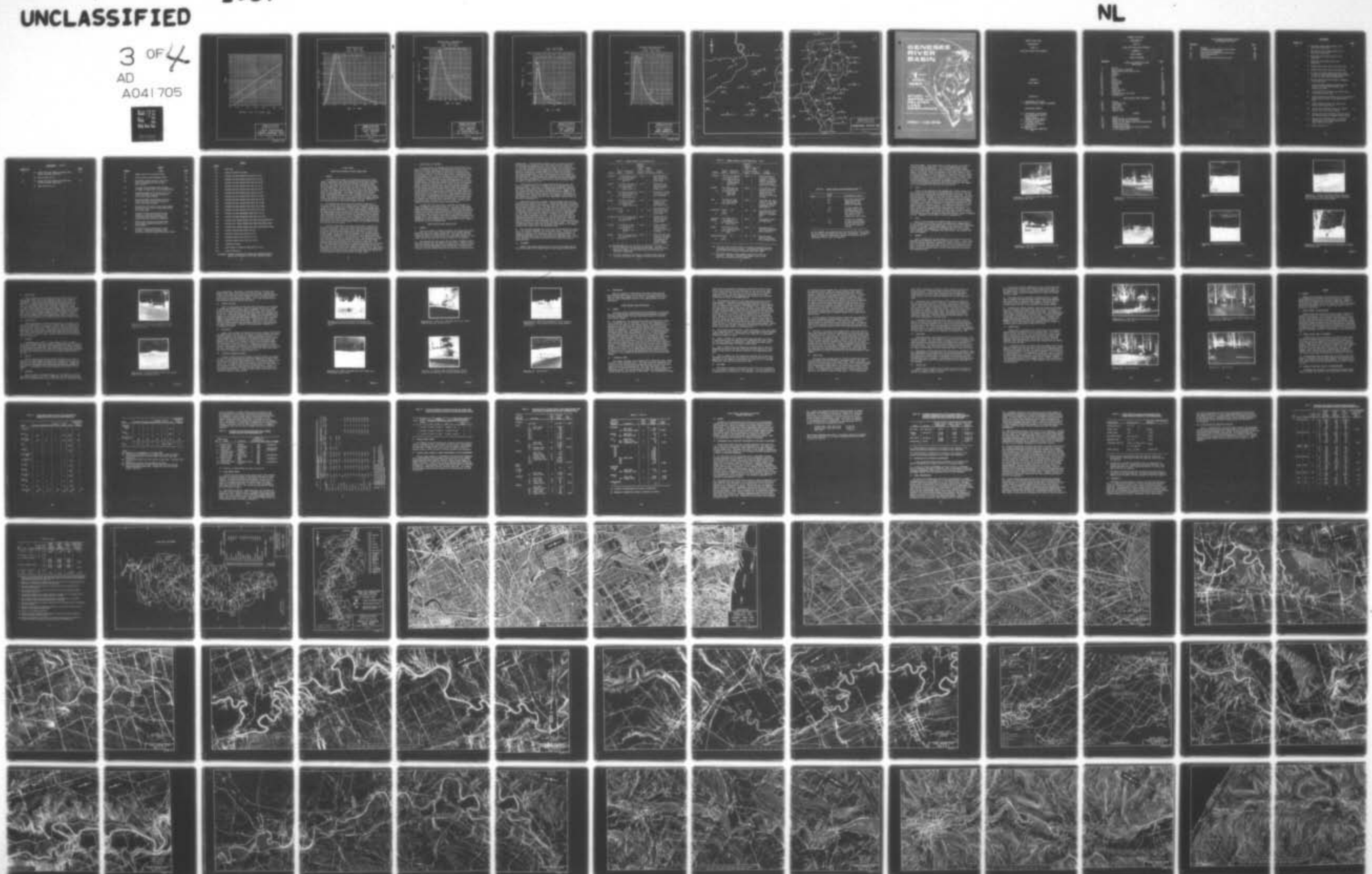
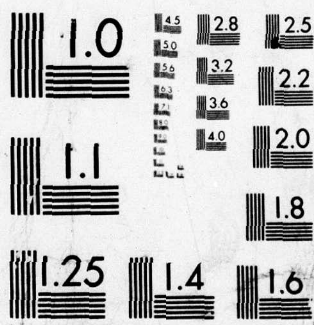
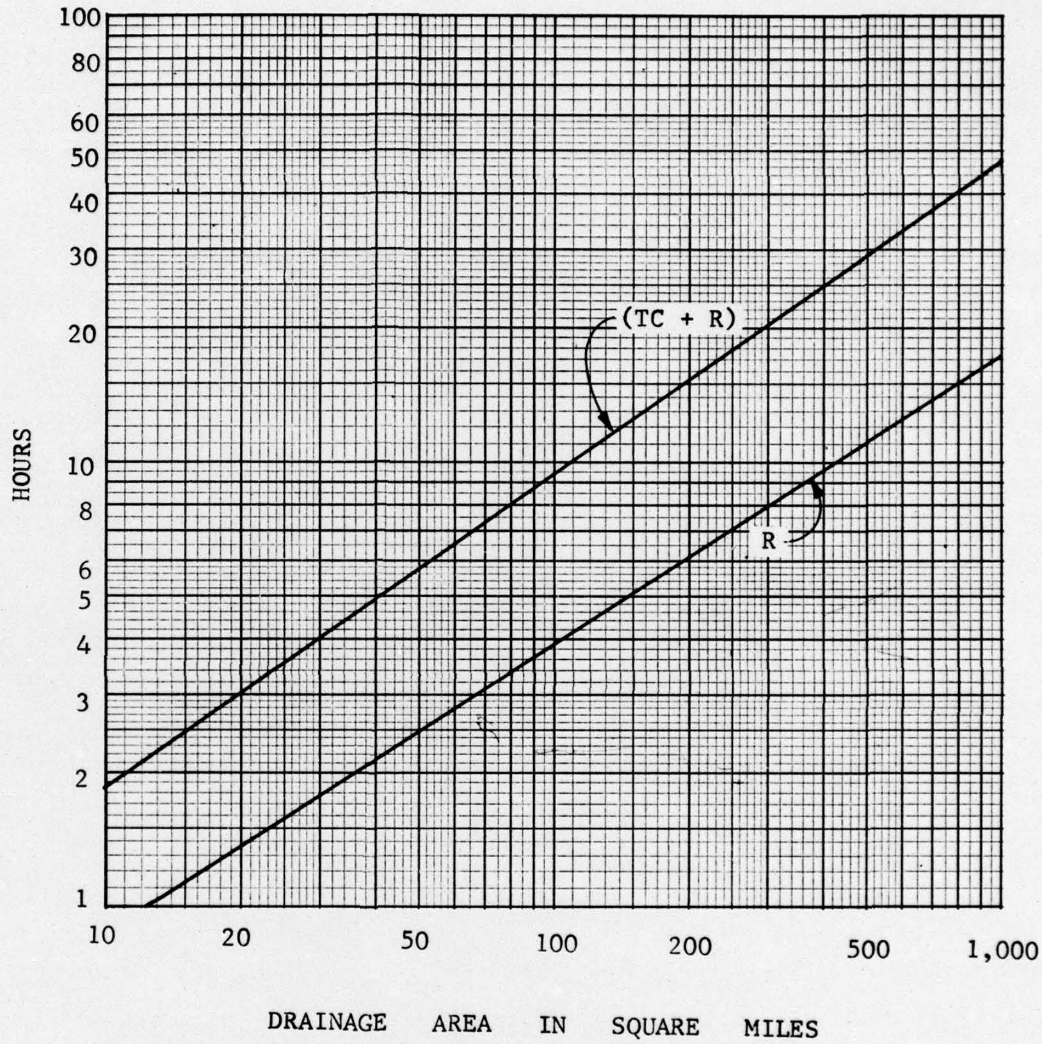




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

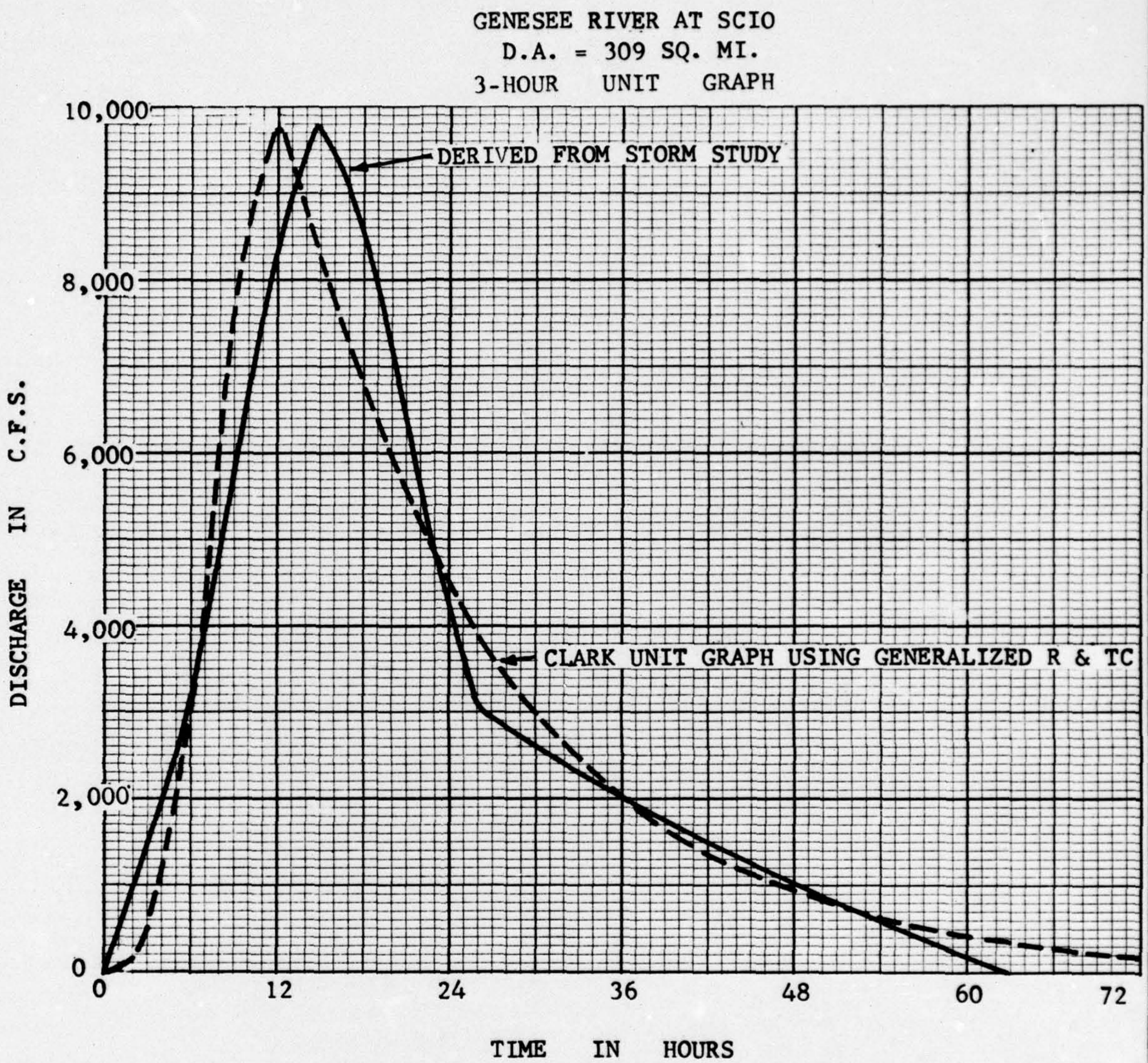


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

CLARK'S COEFFICIENTS VERSUS DRAINAGE AREA

U. S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E6A

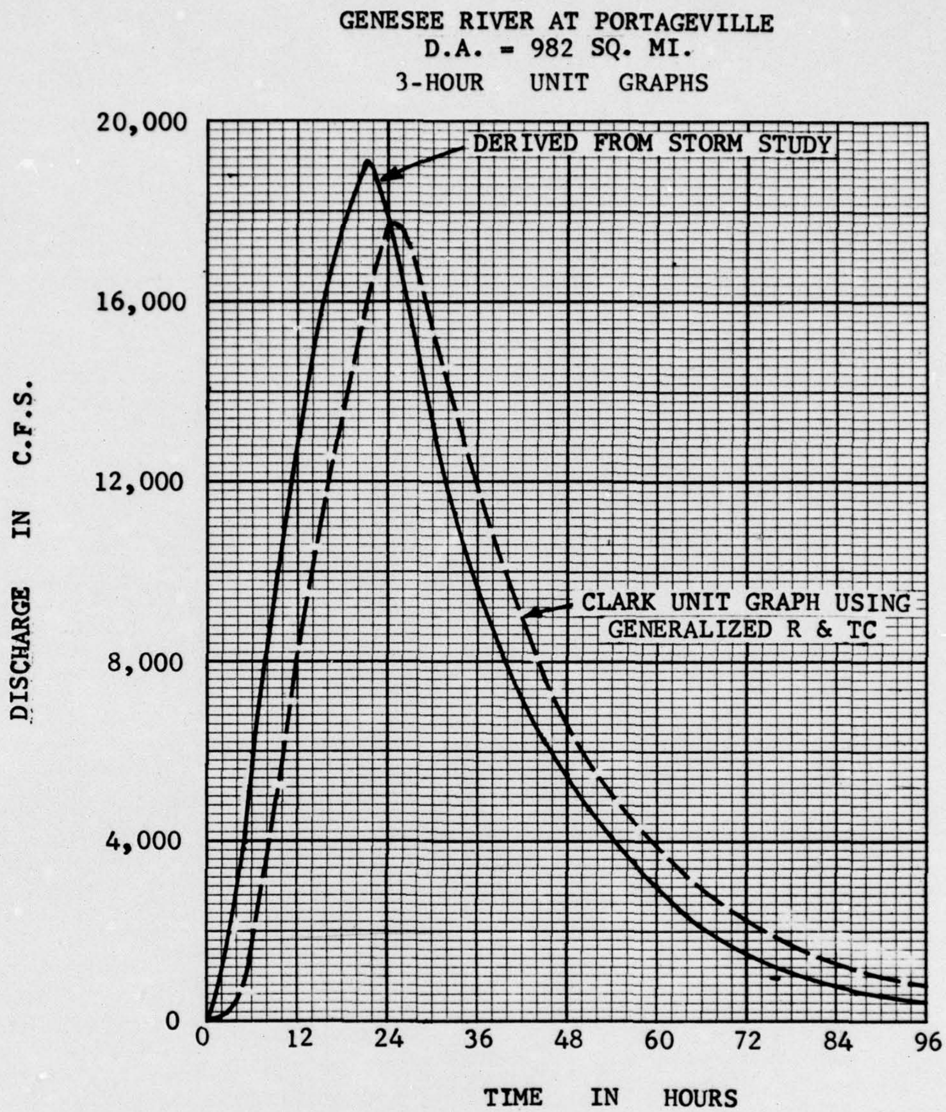


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

UNIT GRAPHS
AT SCIO

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E7A

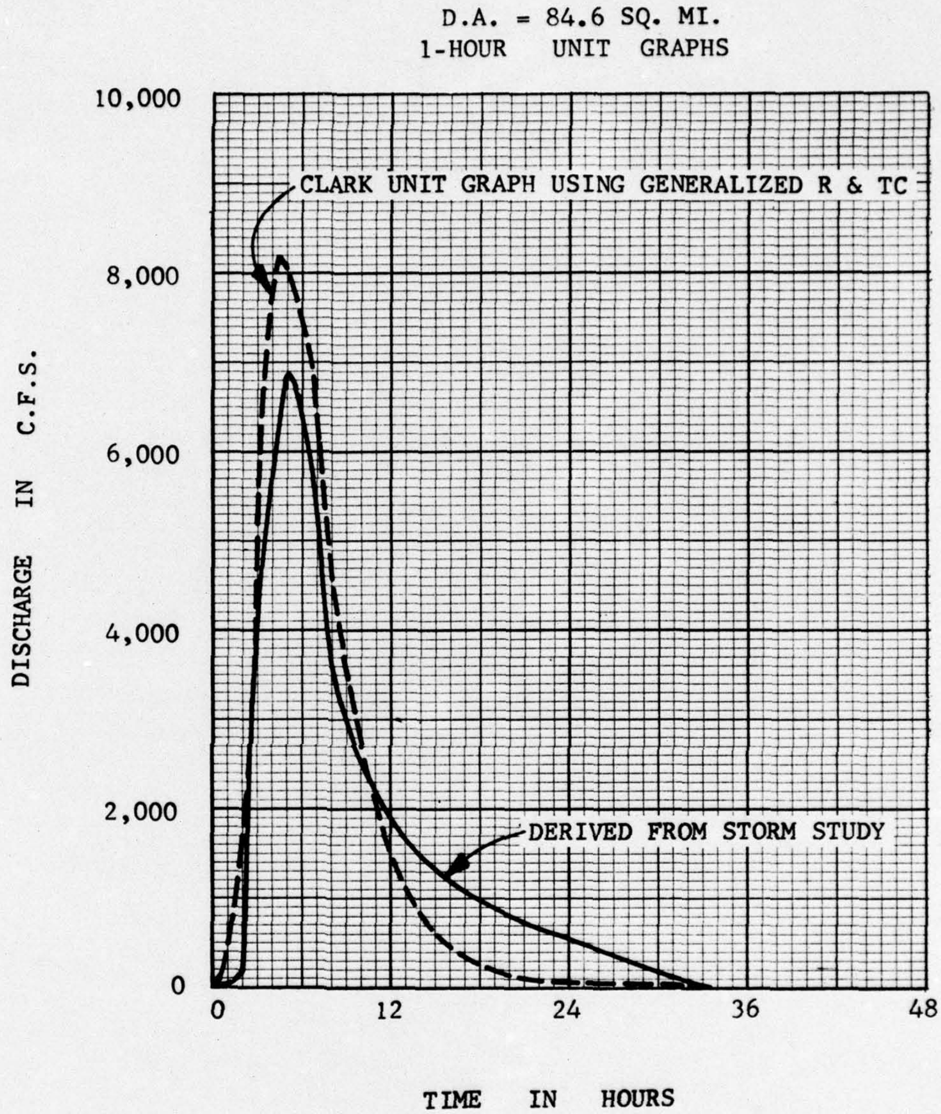


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

UNIT GRAPHS
AT PORTAGEVILLE

U. S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E8A

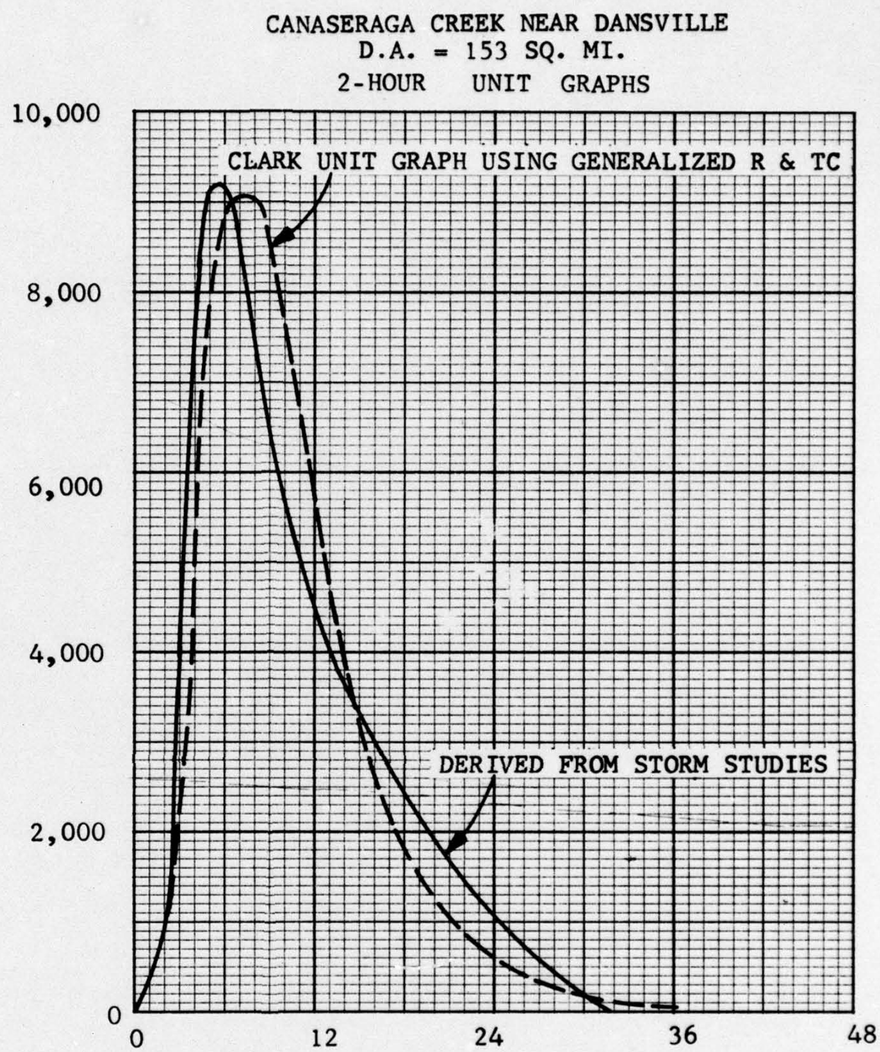


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

UNIT GRAPHS AT ANGELICA

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE E9A



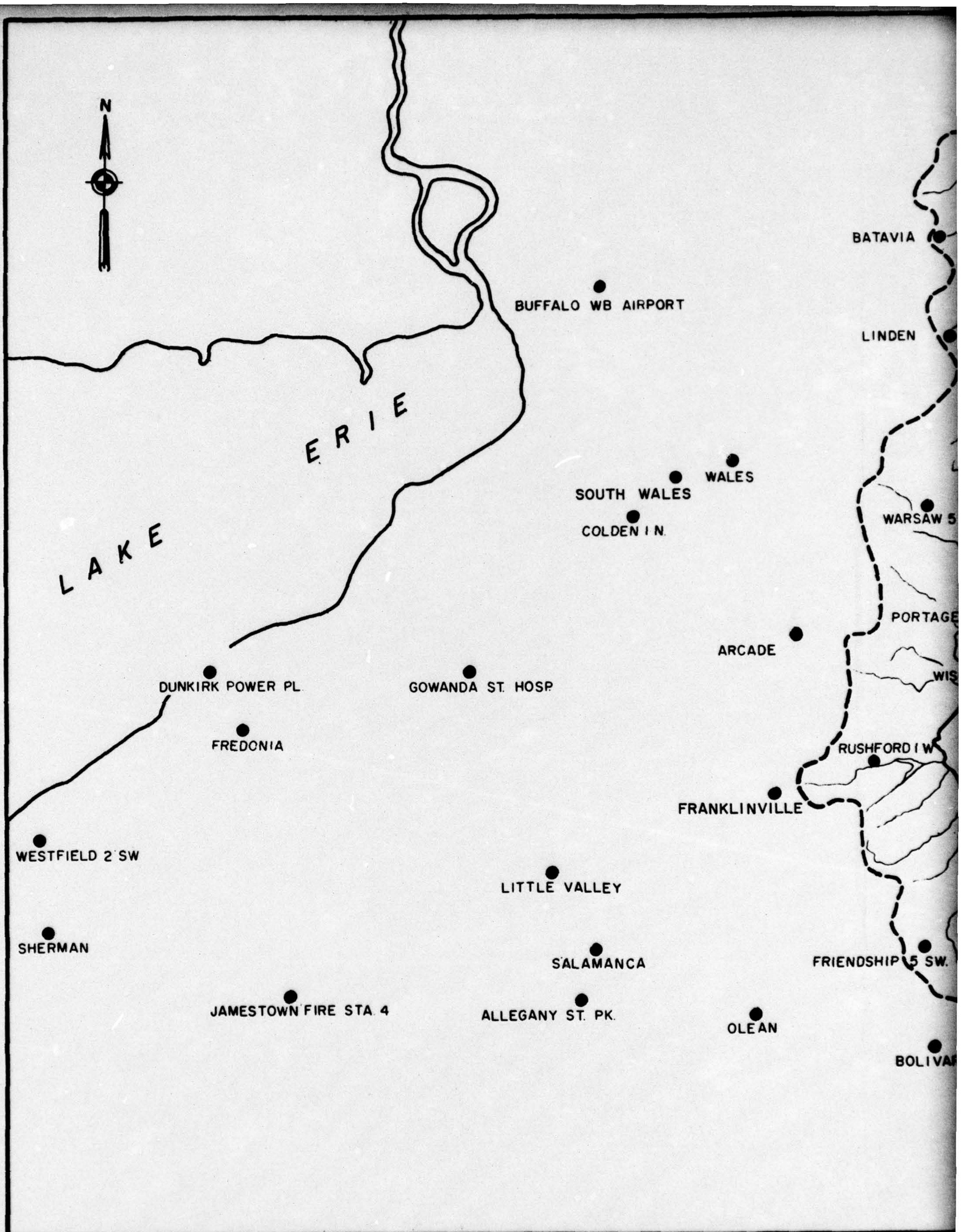
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

UNIT GRAPHS NEAR DANSVILLE

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE E10A


N
LAKE ERIE
BUFFALO WB AIRPORT
BATAVIA
LINDEN
WALES
SOUTH WALES
COLDEN I N.
WARSAW 5
PORTAGE
ARCADE
DUNKIRK POWER PL.
GOWANDA ST. HOSP.
FREDONIA
RUSHFORD I W
FRANKLINVILLE
WESTFIELD 2 SW
LITTLE VALLEY
SHERMAN
SALAMANCA
FRIENDSHIP 5 SW.
JAMESTOWN FIRE STA. 4
ALLEGANY ST. PK.
OLEAN
BOLIVAR

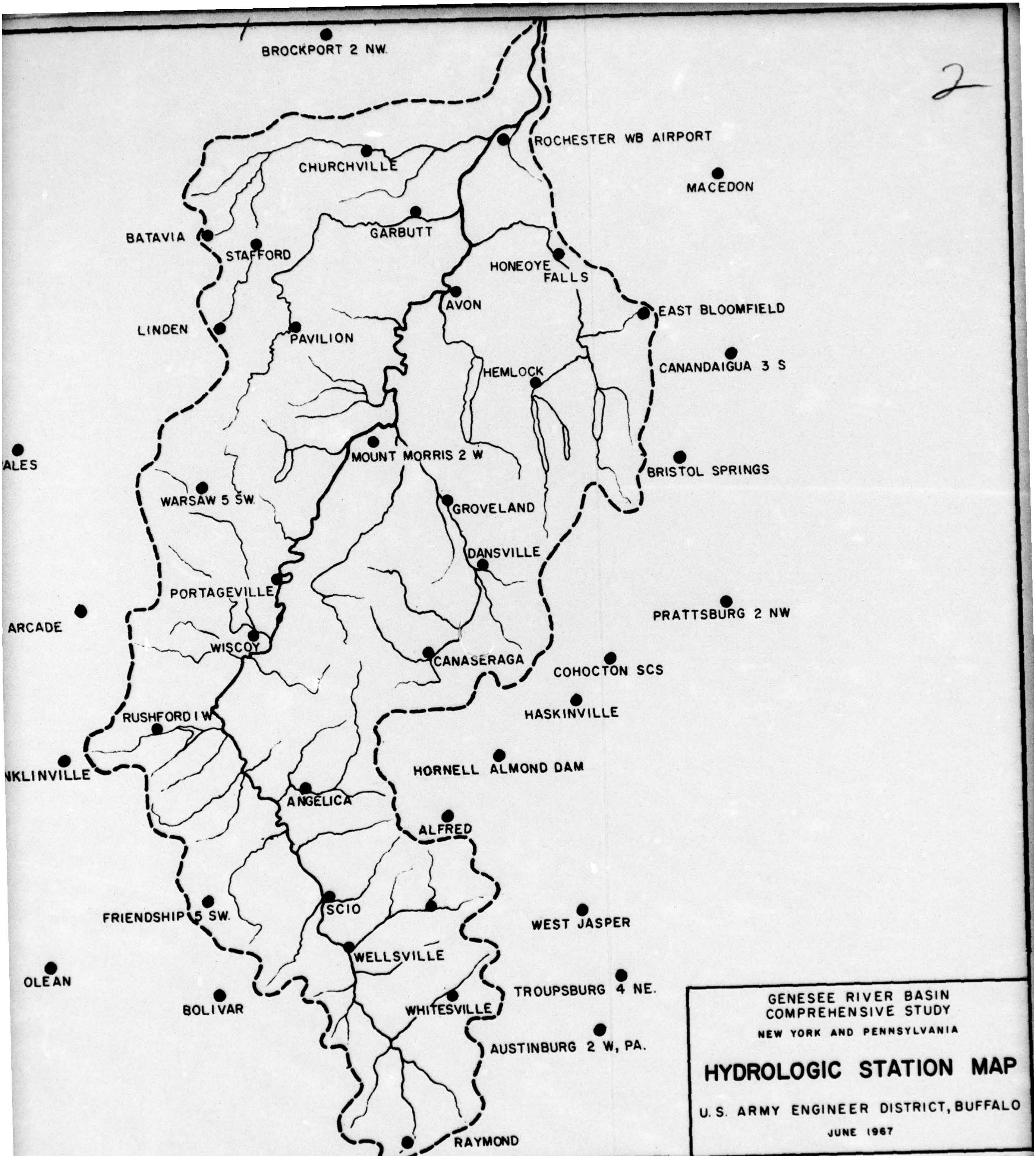
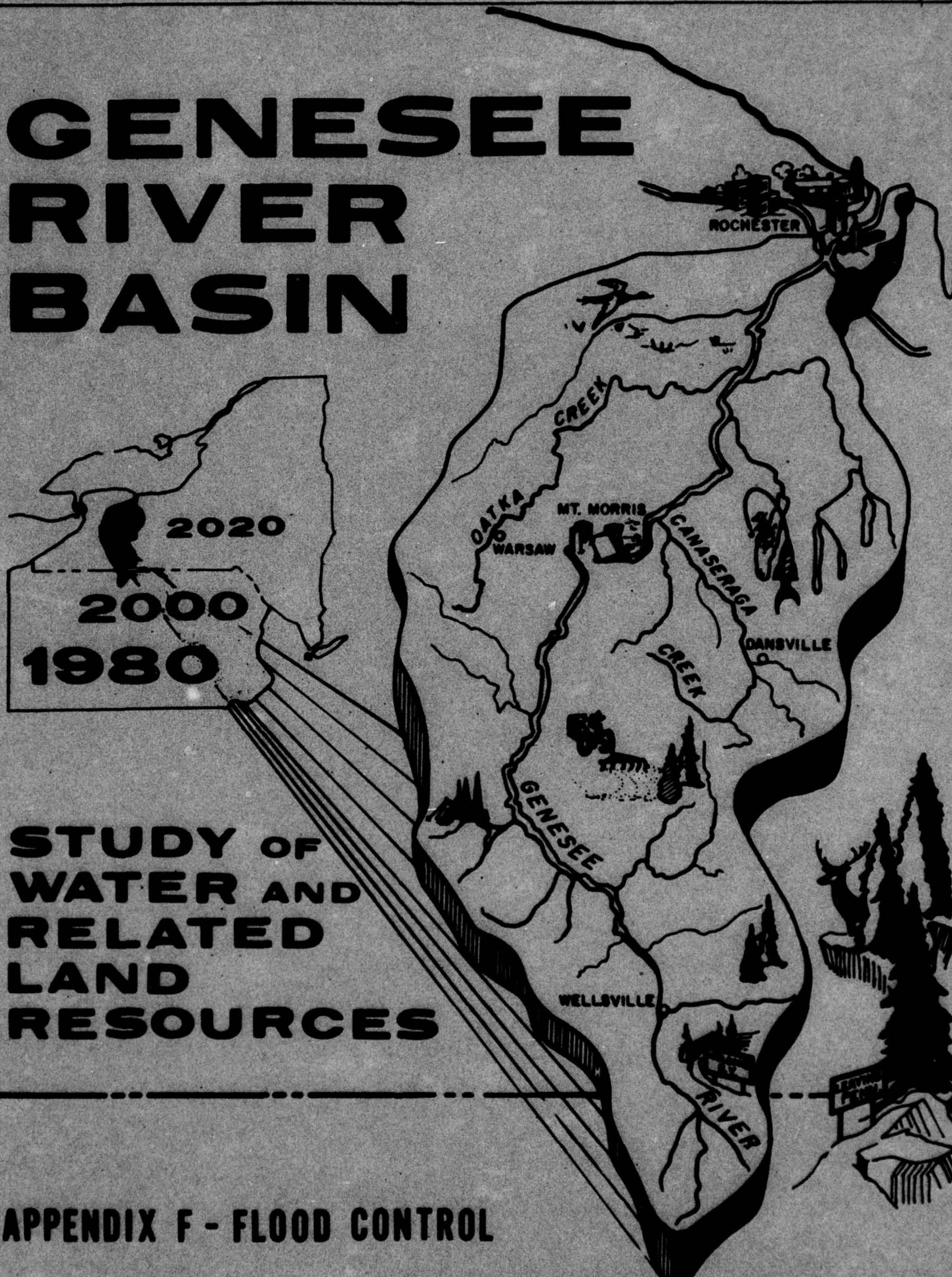

2
BROCKPORT 2 NW.
ROCHESTER WB AIRPORT
MACEDON
CHURCHVILLE
GARBUTT
BATAVIA
STAFFORD
HONEOYE FALLS
AVON
EAST BLOOMFIELD
LINDEN
PAVILION
CANANDAIGUA 3 S
HEMLOCK
ALES
MOUNT MORRIS 2 W
BRISTOL SPRINGS
WARSAW 5 SW.
GROVELAND
DANSVILLE
PORTAGEVILLE
ARCADE
PRATTSBURG 2 NW
WISCOY
CANASERAGA
COHOCTON SCS
HASKINVILLE
RUSHFORD 1 W
NKLINVILLE
HORNELL ALMOND DAM
ANGELICA
ALFRED
SCIO
FRIENDSHIP 5 SW.
WEST JASPER
WELLSVILLE
OLEAN
TROUPSBURG 4 NE.
BOLIVAR
WHITESVILLE
AUSTINBURG 2 W, PA.
RAYMOND
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
HYDROLOGIC STATION MAP
U. S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE E1A

GENESEE RIVER BASIN



STUDY OF WATER AND RELATED LAND RESOURCES

APPENDIX F - FLOOD CONTROL

GENESEE RIVER BASIN

COMPREHENSIVE

STUDY OF

WATER AND RELATED LAND RESOURCES

APPENDIX F

FLOOD CONTROL

PREPARED BY

U. S. DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS

COOPERATING AGENCIES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
ECONOMIC RESEARCH SERVICE
U. S. DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY
U. S. DEPARTMENT OF COMMERCE
WEATHER BUREAU
NEW YORK STATE
WATER RESOURCES COMMISSION

1967

GENESEE RIVER BASIN

COMPREHENSIVE

STUDY OF

WATER AND RELATED LAND RESOURCES

APPENDIX F

FLOOD CONTROL

TABLE OF CONTENTS

FLOOD CONTROL IMPROVEMENTS WITHIN
THE GENESEE RIVER BASIN

PHOTOGRAPHS

PHOTOGRAPHS (Cont'd)

TABLES

PLATES

FLOOD CONTROL

EXTENT AND CHARACTER OF FLOOD DAMAGE AREAS

1. GENERAL

The Genesee River rises in the Allegheny Mountains in Potter County, Pennsylvania, and flows generally north for about 157 river miles to empty into Lake Ontario at Rochester (Charlotte) Harbor, New York. The basin, shown on plate F1, has an elliptical shape, with a maximum width, east and west, of about 40 miles and a length of about 100 miles. The total watershed area is 2,479 square miles, of which 1,077 square miles are above Mount Morris Dam, and 96 square miles are in Pennsylvania. The largest tributary of the Genesee River is Canaseraga Creek, which joins the Genesee River about 4 miles below Mount Morris Dam, and has a drainage area of 334 square miles. The southern portion of the Genesee River watershed, upstream of Mount Morris Dam is mildly mountainous, while the topography of the northern portion of the basin is gently rolling.

2. The Genesee River drops from about elevation 1,080 feet to elevation 768 feet over the 3 Portage Falls in Letchworth State Park at the head of the Mount Morris Reservoir area, flowing through deep gorges cut in rock formations. It then flows through a narrow valley and deep gorge to enter the broad lower Genesee Valley at Mount Morris. The lower Genesee Valley between Mount Morris and Rochester, and the lower Canaseraga Creek Valley between its confluence with the Genesee River and Dansville consist of a flat alluvial plain up to 3 miles in width, which is frequently subjected to flooding. The valley is largely agricultural and is devoted to raising of truck crops, grain and beef cattle. The soils of the Genesee Valley are considered as among the most fertile in the State.

3. The city of Rochester at the mouth of the river is partly protected by flood walls. These protective flood walls, constructed by the City of Rochester around 1915, extend from the Court Street dam to the New York State Barge Canal and are sufficient to carry a discharge of about 55,000 cfs without overtopping. The northern portion of the channel, downstream of the flood walls, has a varying capacity of 22,000 cfs to 33,000 cfs. In this area the river drops over 3 falls from an elevation of 472 to elevation 247 feet. The available head from the 3 falls has been partially developed for run-of-the-river hydroelectric plants by the Rochester Gas and Electric Corporation. The New York State Barge Canal crosses the Genesee River just south of Rochester. The river and the canal have a common pool elevation of 513 feet above mean sea level, which is maintained by a movable dam at Court Street operated by the State of New York. Channel capacities in the agricultural areas south of the New York State Barge Canal vary from about 12,000 cfs at Jones Bridge to about 15,000 cfs near the Barge Canal.

4. AREAS SUBJECT TO FLOODING

The areas subject to flooding along the Genesee River lie in Monroe, Livingston, Wyoming and Allegany Counties in New York State. Plate F2 is a index map showing the locations of plates F3-F15, which show flooded areas along the main stem of the Genesee River, and Canaseraga Creek. The flooded area becomes increasingly wider as the Genesee Valley, from the confluence of the Genesee River and Canaseraga Creek to the mouth of the Genesee River at Lake Ontario, is gradually transformed from the deep upstream gorges to a broad alluvial plain. The greatest damages are suffered in the area from the New York State Barge Canal to the village of Avon in Livingston County. Operation of Mount Morris Dam and the protective walls within the city of Rochester have limited significant flooding in the area downstream from the Barge Canal to very rare occasions. In the northern portion of the city of Rochester, downstream of the protective walls, two manufacturing companies have less protection than provided in the heart of the city. These companies have an expected chance of flood damage from the Genesee River of about once in 125 years. Undeveloped properties between the protective walls in Rochester and the mouth have an expected chance of overflow by the Genesee River as frequent as once in 5 years. However, these damages are mainly clean up and are considered minor.

5. Flooding above the Mount Morris reservoir is confined to a narrow floodway by steep valley walls of a relatively undeveloped, rugged and moderately mountainous region. Agricultural and pasture lands are the principle areas inundated by floods above Portageville, although some scattered residential and farm buildings built in low lying areas along the banks of the Genesee are frequently affected by high water. The exception from light residential and agricultural damages in the upper Genesee Valley is the village of Wellsville. A description of the recommended plan of improvement for the village of Wellsville is given in paragraph F59.

DAMAGE REACHES ALONG GENESEE RIVER

6. GENERAL

Due to the number of reaches throughout the Genesee River Basin, each reach was given a name, usually that of the largest community within the reach, for easier recognition. The names used for the reaches are given in the subtitle of the descriptive paragraph of each reach, and can also be found in various tables of this appendix.

7. The locations of index points and the limits of damage reaches along the Genesee River are shown on plates F3-F13. Limits of the 50-year flood outline with Mount Morris in operation are shown on plates F3-F7 for the area downstream of Mount Morris Dam. The 1950 flood outline is shown on plates F9-F13 for the flood plain along the upper

Genesee River. The Mount Morris reservoir area is shown on plate F8. The discharge and frequency of the 1950 flood vary from 18,600 cfs at a 125-year recurrence interval in the Shongo reach to 31,900 cfs at a 10-year frequency in the Portageville reach. Two different flood outlines are shown for the main stem of the Genesee River because since the construction of Mount Morris Dam no storm has occurred of such area and magnitude to cause flooding along the entire length of the Genesee River. Flooded areas for communities in the Genesee Basin that are under a separate flood control study by the Corps of Engineers are shown on Plates F16-F18. Flood profiles along the Genesee River are shown on plates F19 to F22.

8. Brief descriptions of the damage reaches and index points are given in tables F1 and F2 for the main stem of the Genesee River and Canaseraga Creek. Description of damages along tributaries studied by the Corps of Engineers are given in paragraphs F24-45. Damages along the tributaries above Mount Morris and the agricultural damages on the tributaries below Mount Morris were studied by the U.S. Department of Agriculture, Soil Conservation Service. The damages, both agricultural and residential in nature, from the Soil Conservation Service study are described in paragraph F50.

9. Estimated average annual damages along the Genesee River and its tributaries are tabulated in table F7. Fifteen reaches along the Genesee River and three reaches along Canaseraga Creek were selected to cover the most frequently flooded areas. For this report the remainder of the tributaries were considered to have one reach for their entire length. The reaches were selected because the flooded area in each reach was subject to flooding of about the same frequency of occurrence to approximately the same stage and because the effects of higher or lower discharges would be uniform throughout the reach. The reach limits were also set, considering anticipated reservoirs, so that the entire reach would be affected similarly by both natural and improved conditions. Table F1 shows the approximate initial damaging stage and its estimated recurrence frequency in years for each reach along the Genesee River. Plate F1 shows the approximate reach limits and the general relationship of the damage reaches of the Genesee River and Canaseraga Creek.

10. The following paragraphs F11 to F45 give the description and character of the reaches throughout the Genesee River basin. Plates F3 to F15 should be referred to for location of areas or of places mentioned in subsequent paragraphs for the Genesee River and Canaseraga Creek. Detailed flooded outline maps for the Genesee River and Dyke Creek in Wellsville, Red Creek in Henrietta and Oatka Creek in Warsaw are shown on plates F16-F18.

11. ROCHESTER

Reach 1 lies almost entirely within the city of Rochester extending from the mouth of the Genesee River at Lake Ontario to the New York

TABLE F1. - Damage reaches of the Genesee River

Reach	River mile	Index point location	Initial damaging stage in feet U.S.C.&G.S datum	Approx. frequency in years	Limits of reach
Rochester 1	0.0 to 11.6	The gage at Driving Park Avenue in Rochester, mile 6.1	260.8	5	From the mouth at Lake Ontario to the New York State Barge Canal.
Chili (1) 2	11.6 to 21.1	The confluence of Black Creek and the Genesee River, mile 14.1	516.9	1	Between the New York State Barge Canal and Brown's Bridge. (1)
Avon 3	21.1 to 35.3	The confluence of Honeoye Creek and the Genesee River, mile 26.6	529.0	1	From Brown's Bridge to the gage site at the Avon Bridge.
Geneseo 4	35.3 to 65.5	At the upstream side of Fowlerville Road Bridge, mile 40.6	540.0	3	Between the Avon Bridge and the Rochester Gas and Electric Dam.
Mount Morris 5	65.5 to 86.0	(2)	(2)	(2)	From Rochester Gas and Electric Dam to the Erie Railroad Bridge.
Portageville 6	86.0 to 96.0	At the gage site in Portageville, mile 86.7	1099.0	2	Between the Erie Railroad Bridge and the mouth of Wiscoy Creek.
Fillmore 7	96.0 to 110.6	400 feet downstream of the bridge in Fillmore, mile 99.9	1165.7	2	From the mouth of Wiscoy Creek to 2200 feet downstream of the bridge at Oramel.
Belfast 8	110.6 to 120.0	At the gage site in Belfast, mile 113.5	1261.0	2	From 2200 feet downstream of the bridge at Oramel to 6300 feet upstream of Transit Bridge, south of Belfast.

(1) In this reach, only the left bank was considered. The right bank was included in the Red Creek Interim Report for Flood Control. Reference is made to the Red Creek Report for more detail and informative computations.

(2) This reach includes the area known as Letchworth State Park and is mainly a deep gorge that contains the Mount Morris Reservoir.

TABLE F1. - Damage reaches of the Genesee River - Contd.

Reach	River mile	Index point location	Initial damaging stage in feet U.S.C.&G.S datum	Approx. frequency in years	Limits of reach
Belvidere 9	120.0 to 125.1	At the upstream side of New York Route 408 bridge over the Genesee River, mile 123.0	1320.0	1	From 6300 feet upstream of Transit Bridge to a section 6800 ft. downstream of New York State Route 244 in Belmont.
Belmont 10	125.1 to 131.0	400 feet upstream of New York State Route 244, mile 126.7	1366.0	2	From 6800 feet downstream of New York State Route 244 to 3300 feet downstream of the bridge in Scio.
Scio 11	131.0 to 136.0	At the gage site at Scio, mile 132.8	1446.5	1	From 3300 feet downstream of the bridge in Scio to 1500 feet downstream of New York Route 17.
Wellsville 12	136.0 to 138.8	(3)	(3)	(3)	From 1500 feet downstream of New York Route 17 to Weidrick Road.
Stannards Corners 13	138.8 to 140.8	3000 feet upstream of Weidrick Road, mile 139.4	1511.5	1	From Weidrick Road to Hanks Road.
Shongo 14	140.8 to 148.0	1600 feet upstream of Hanks Road, mile 141.1	1529.1	1	From Hanks Road to the New York-Pennsylvania stateline.
Pennsylvania 15	148.0 to 156.5	(4)	(4)	(4)	From the state line to the source of the Genesee River.

(3) This reach lies entirely within the village of Wellsville and has a completed flood control project. More detailed information has been included in the Design Memorandum dated April 1966.

(4) This reach consists of very rugged terrain and is quite undeveloped. Therefore, insignificant damages occur in this area and no detailed data were compiled.

TABLE F2. - Damage reaches along Canaseraga Creek (1)

Reach	Creek mile	Description of reach
1	11.6 to 16.7	This reach lies approximately between the communities of West Sparta and Woodville.
2	8.0 to 11.6	The area between the southwest side of the Erie Lackawanna Railroad and N.Y. Route 36 from Sonyea to the community of West Sparta.
3	1.3 to 8.0	*The area is triangular* in shape and is bounded by Erie Lackawanna Railroad and N.Y. Route 63 and 408.

For the appendix the Canaseraga Creek was divided into three reaches, and only general information and data were incorporated. Informative report on considered improvements, damages and economics for the Canaseraga Valley is given in appendix C.

State Barge Canal. Below Court Street the flood outline is limited to a narrow floodway by high bluffs. The initial damaging stage below Court Street has approximately a 5-year recurrence interval, however the areas flooded at the initial stage are mainly undeveloped with minor damage. Above Court Street the remainder of the reach consists of concentrated development, which is protected by flood walls that are capable of containing 55,000 cfs. This discharge of 55,000 cfs is greater than the maximum known flood flow of 54,000 cfs that occurred in 1865. Floods of greater magnitude than 55,000 cfs are possible. Although a major flood through Rochester would result in enormous damages to the city, a flood of this magnitude would have such a rare occurrence that damages on an average annual basis would be only about $5,000.

12. CHILI

Reach 2 is the majority of the drainage area of Black Creek in the town of Chili on the left bank of the Genesee River between the New York State Barge Canal on the north and Brown's Bridge on the south. The east and west limits of flooding in this reach are the Genesee River and Chili Road respectively. Flooding in this reach causes a variety of damages including residential, commercial, public, agricultural and highway damage. Development in this area consists of homes of moderate value constructed in suburban type tracts by individuals. Examples of development in this reach are shown in exhibits 1 and 2. The undeveloped land that is still farmed consists of a good productive soil as shown in exhibit 3. Exhibit 4 shows local drainage projects undertaken by local farmers. The right bank of the Genesee River from the Barge Canal to Brown's Bridge is drained by Red Creek. An interim report for flood control for the Red Creek drainage area was completed by the Buffalo District, Corps of Engineers in 1965. A summary of this report is given in paragraph F57.

13. AVON

Reach 3, which extends from Brown's Bridge in the town of Chile to the Avon Bridge in the village of Avon, has agricultural damages mainly on the left bank between the Genesee river to the east and the Pennsylvania Railroad to the west. Agricultural damages on the right bank in this reach are caused by backwater from the Genesee River to the surrounding area of Honeoye Creek. Flooding in this area affects rich cropland, pastures and highways.

14. GENESEO

Reach 4 extends from the Avon Bridge in the village of Avon to the Rochester Gas and Electric Dam in the town of Mount Morris. In this reach minor agricultural flooding is confined to a narrow floodway, due to the rise in the valley walls that begin to form the gorge of Letchworth State Park. In addition, discharges are controlled by the reservoir at Mount Morris, which has complete control in this reach except for the outflow from Canaseraga Creek.

Photo No. 1. Residences along Chester Avenue in the Chili area 10 May 1966.

Photo No. 2. New home for sale on Names Road in the Chili area 10 May 1966.

EXHIBIT 1

Photo No. 3. Residences along Alfred Avenue in the Chili area.

Photo No. 4. Residences along Names Road in the Chili area.

Photo No. 5. Farmland along Route 251 in the Chili area.

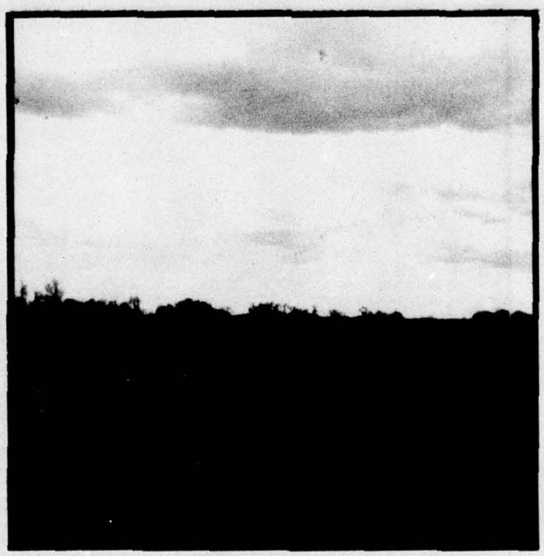


Photo No. 6. Farmland along Route 253 in the Chili area.

Photo No. 7. A Chili area farmer laying field drain tile in order to drain field quicker after flooding so that the land could be worked sooner.

Photo No. 8. Another method used for drainage of farmland in the Chili area.

15. MOUNT MORRIS

Reach 5 extends from the Rochester Gas and Electric dam in the town of Mount Morris to the Erie Railroad bridge in the village of Portageville. There are no flood damages in this reach, since it essentially contains the Mount Morris reservoir and Letchworth State Park. At the southern end of this reach near Portageville, there are three falls with a total drop of 248 feet. This reach divides the lower Genesee Valley from the upper Genesee Valley and Mount Morris reservoir is the control for floods in the lower portion of the watershed. Because of the large drainage area of the Genesee River basin, storms do not usually affect the entire basin. Therefore a storm that causes flooding in the upper Genesee Valley would be modified by the Mount Morris reservoir to a normal flow in the lower Genesee Valley.

16. PORTAGEVILLE

Reach 6 extends from the Erie Railroad Bridge, just north of the village of Portageville, to the mouth of Wiscoy Creek. On the east and west the flooded outline is bounded by the Erie Railroad and New York State Route 19A, respectively. Flood damages in this reach are mainly agricultural with flood waters inundating cropland and pastures, along with a few residential homes that have been constructed in low areas of the flood plain. Exhibit 5 shows a typical home built along the Genesee River in this reach.

17. FILLMORE

The damage area in reach 7 is very similar to that in reach 6. Floods affect farmland and a few residential homes that have been erected in the flood plain. Some homes in the communities of Fillmore, Houghton and Canaedea are also affected. This reach in the town of Hume is bounded by the village of Wiscoy to the north, the village of Oramel to the south, New York State Routes 19 and 19A to the west, and the Erie Railroad to the east.

18. BELFAST

Reach 8 extends south from the village of Oramel in the town of Belfast. The flood outline is bounded on the west and east by New York State Route 19 and a light duty county road, respectively. Damages in this reach are relatively minor, occurring from inundated farmland and pastures. No residential or commercial damages were recorded in this reach.

19. BELVIDERE

Reach 9 extends from Transit Bridge, south of Belfast, to the New York Route 244 bridge in the town of Angelica. The east and west boundaries of the flooded outline are the Erie Railroad and a light duty county

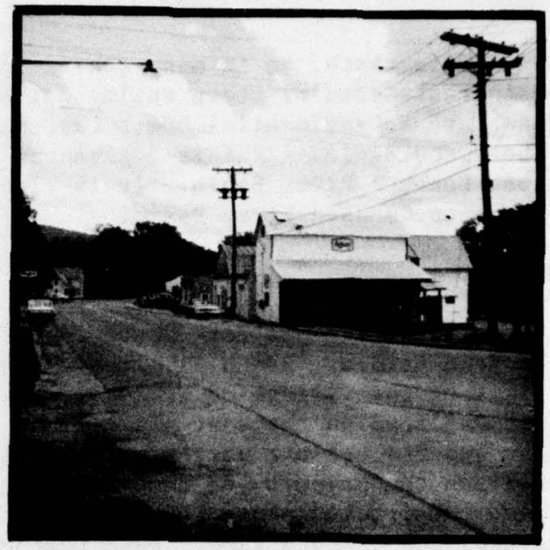


Photo No. 9. A typical small community, located along the banks of the upper Genesee River, and affected by floods.

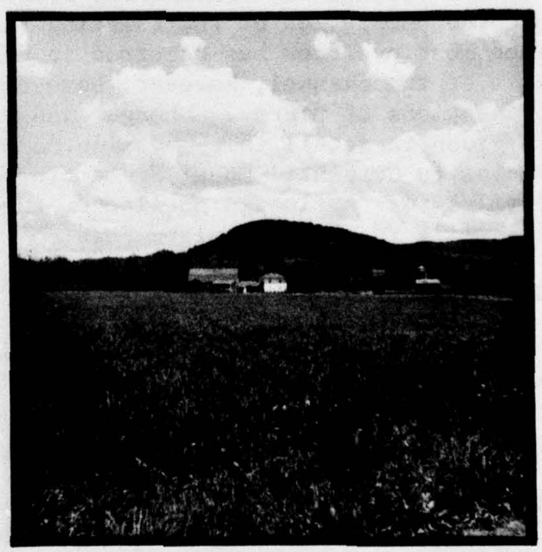


Photo No. 10. A typical farm unit within the flooded areas of the upper Genesee River.

road, respectively. This reach, as in many others in the basin, has a narrow flood plain restricted by steep valley walls. Damages from floods in this reach are to residential homes that have been constructed in low areas of the flood plain. Exhibit 5 gives an example of farmland along the upper Genesee River Basin. It is also an indication of the development in upper Genesee River Basin.

20. BELMONT AND SCIO

Reach 10 lies between the New York Route 244 bridge in the village of Belmont and the Scio Bridge. Reach 11 extends from the Scio Bridge to the northern limit of the village of Wellsville. Both reaches are bounded by the Erie Railroad on the east and a light duty or gravel road on the west. These two reaches are very similar in both development and damages. In each reach the majority of damages are to residential development that has been constructed along the banks of the river, and minor damage to agricultural and pasture land. Both reaches have a narrow floodway bounded by steep valley walls. Exhibits 6 & 7 show both the older type farm houses and new development within the flood plain along the upper Genesee River. Exhibit 6 also shows typical farmland that is affected by floods.

21. WELLSVILLE

Reach 12 lies between the northern limit of the village of Wellsville and Weidrick Road just south of the village. Periodic flooding has caused extensive damage to the village and neighboring agricultural areas, although damage since the completion of the existing flood control project has been minor since most overflow has occurred in undeveloped areas. Damages to the banks of the channel, however, have necessitated repair and replacement of sections of riprap. Damages and a flooded outline for this reach are given in detail in the Design Memorandum for Rectification of Deficiencies in Completed Local Protection Project at Wellsville, New York, dated April 1966. A flooded outline of the 1950 flood within the village of Wellsville is shown on plate F-16.

22. STANNARDS CORNERS AND SHONGO

Reaches 13 and 14 are quite similar in both development and damages in that both have residential and commercial damages and a narrow floodway that is restricted by steep valley walls. The combined length of both these reaches extends from Weidrick Road to the New York-Pennsylvania State line. The eastern limit of both reaches is New York State Route 19 and the western limit is the Baltimore and Ohio Railroad. However, at the community of Shongo, these east and west limits reverse banks and become the opposite limits. Exhibit 8 shows typical new homes that are affected by floods in these reaches.

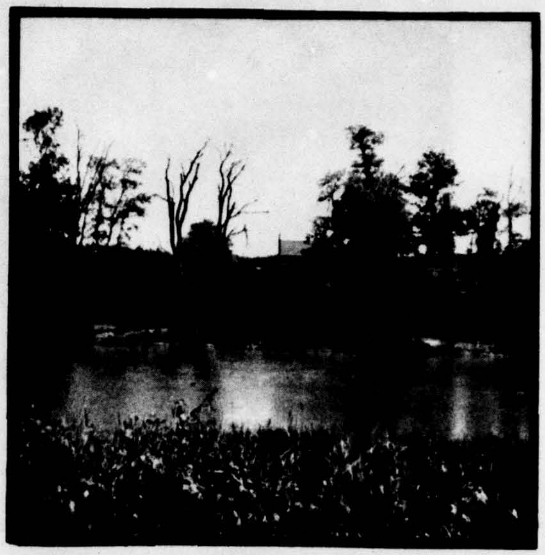


Photo No. 11. Typical farmhouse constructed within the flooded areas along the banks of the upper Genesee River.

Photo No. 12. Typical farmland within the flooded area of the upper Genesee River.

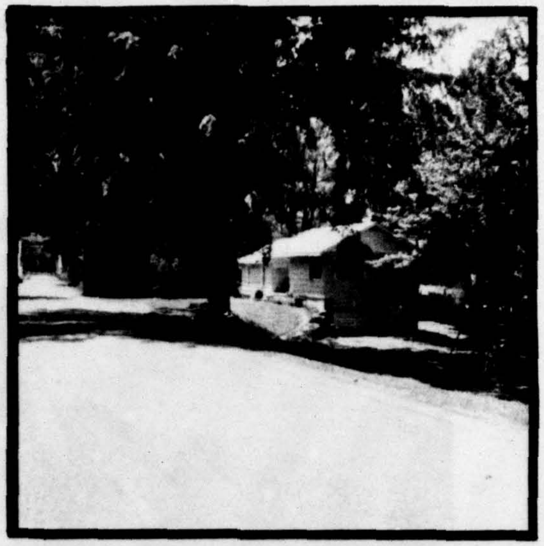


Photo No. 13. Typical new development within the flooded areas of the upper Genesee Valley.

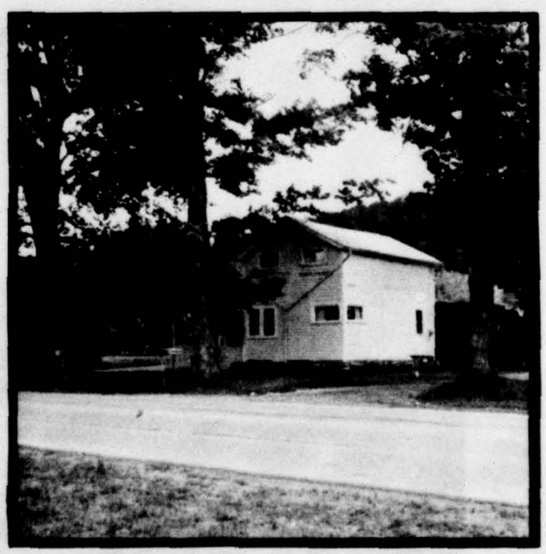


Photo No. 14. Typical order type development located within the flooded areas of the upper Genesee Valley.

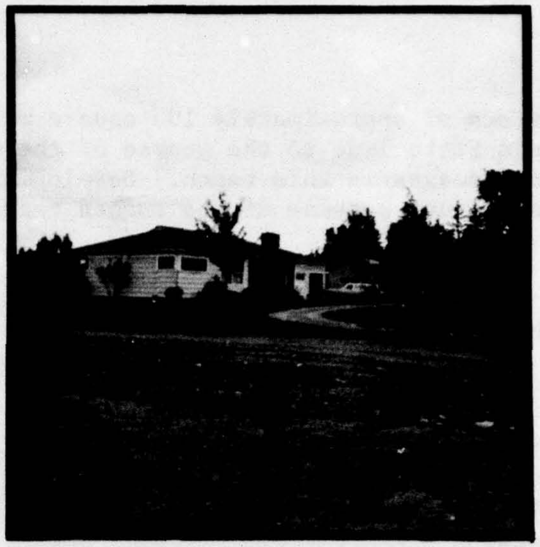


Photo No. 15. Typical new development that is gradually taking place in the flooded areas of the upper Genesee River Basin.

Photo No. 16. Same as photo.

23. PENNSYLVANIA

Reach 15 consists of approximately 100 square miles from the New York-Pennsylvania State line to the source of the Genesee River. There are only minor damages in this reach. Development in the flood plain is almost nonexistant because of the rugged terrain and inaccessibility.

DAMAGE REACHES ALONG TRIBUTARIES

24. GENERAL

The areas subject to flooding from the tributaries of the Genesee River are generally agricultural lands and farm buildings, although in the lower Genesee Valley, the more concentrated areas of development incur heavier damages.

25. The character of the subwatersheds within the Genesee River Basin can be classified into two divisions. Each division represents the character of the upper or lower Genesee Valley. The tributaries in the upper portion of the valley have narrow floodways and swift currents. The area is generally rural in character and the land is either cultivated or undeveloped. Communities are small and relatively far apart. Residential homes other than farmhouses are few. The subwatersheds in the lower portion of the Genesee Valley are almost a direct opposite from the subwatersheds of the upper portion of the Genesee Valley. Tributaries in the lower valley are larger in drainage area, have wider floodways and slower currents. Although the lower Genesee Valley, except for the city of Rochester, is far from being completely developed, existing communities are larger than those in the upper valley and have more concentrated business sections that are more prone to flood damages. The village of Warsaw on Oatka Creek and the towns of Henrietta and Brighton on Red Creek are communities which have suffered serious damage in past floods. In the upper Genesee Valley communities such as Angelica, Bliss, Friendship and Whitesville have suffered flood damages due to their location along bottom land in the steep-sided stream courses.

26. CANASERAGA CREEK

The largest tributary of the Genesee River, Canaseraga Creek, drains an area of about 334 square miles. The creek rises near Barkertown at an elevation of 1900 feet and runs a meandering course for 18 miles through rugged terrain with steep gradients. The creek then emerges, near Dansville, at elevation 700 feet into the broad, flat plain, known as the Canaseraga Valley. This valley extends 15 miles to the Genesee River, and has widths varying from one to three miles. The creek meanders through

this valley in a generally northwesterly direction for about 18 creek miles to the Genesee River near Mount Morris. The fall of the creek in this valley is about 140 feet, of which 100 feet are in the upper three creek miles. The lower portion of the valley has very flat gradients, and ponding from Canaseraga Creek inundates the Canaseraga Valley from the river to Groveland Station.

27. The Canaseraga Valley is a rich agricultural area that is inundated annually by streamflow exceeding channel capacities and poor local drainage. Flooded areas of Canaseraga Creek are entirely agricultural in character from Dansville to the Genesee River. Plates F14-15 show the flooded outline of the April 1961 flood. The greatest damage is suffered during summer floods after the truck garden crops have been planted. Winter and spring floods cause less damage but are destructive to nursery stocks. In reaches 2 and 3 Canaseraga Creek flows on the north side of the valley at an elevation higher than the surrounding land. Because of this, runoff from the hills on the south side of the valley is unable to enter Canaseraga Creek. Ponding of this runoff in the lower Canaseraga valley has been known to last for several months. Spring floods in the lower Canaseraga Valley prevent early planting and limit the type of crops grown due to the shortened growing season. Spring floods are the most frequent, inundating approximately 6,000 acres annually, while summer floods are relatively rare.

28. The following paragraphs give a brief description of the reach limits in the Canaseraga Valley. Table F2 gives the approximate initial damaging stage of each reach in the Canaseraga Valley along with its approximate recurrence interval in years.

29. Reach 1 includes the flooded outline from creek mile 11.6 (which is approximately 1100 feet upstream of an unimproved dirt road) to mile 16.7 near the community of Woodsville. Reach limits and index points for the Canaseraga Valley are shown on plates F14-15.

30. Reach 2 includes the area between the southwest side of the Erie-Lackawanna Railroad and New York State Route 36 from Sonyea to the community of West Sparta, and consists entirely of rich agricultural farm land.

31. Reach 3 includes the area between the northeast side of the Erie-Lackawanna Railroad and New York State Route 63 from the mouth of Canaseraga Creek to the community of Groveland, and like reach 2, is entirely agricultural land used for growing truck crops.

32. RED CREEK

Red Creek is located in the southern part of the city of Rochester and in the towns of Brighton, Henrietta and Rush. The total drainage area is approximately 23 square miles. The topography of the northern half of

the drainage area is extremely flat, with gently rolling hills in the southern portions, where the several branches; East, Middle and West, originate, and flow in a northerly direction. The main channel of the stream is approximately 3 miles in length. It flows into the New York State Barge Canal between the East Guard Gate and the Genesee River, and thus its discharge reaches the river at the canal crossing, just inside the southern city limits of Rochester. The limits of the Red Creek flooded area are shown on plate F17. The areas subject to flooding lie primarily along Red Creek and its branches in an area bounded by the mouth of Red Creek on the north, Maple Street on the south, West Henrietta Road on the east and the Genesee River on the west. Plate F17 shows the bounded limits of the 100-year flooded outline and indicates the extent of the area that would be flooded from the combined effects of Red Creek and the Genesee River.

33. A Interim Report for Flood Control on Red Creek was completed by the Corps of Engineers, Buffalo District in 1965. A summary of this report is given in paragraph F57. Data taken from the Red Creek Interim Report for use in this report are noted as such. For methods used in collecting data and for more detailed data than are given in this report, reference should be made to the above mentioned Red Creek report.

34. Red Creek, a tributary of the Genesee River, enters the New York State Barge Canal about 1,000 feet southeasterly of the canal and river crossing at Rochester, New York. Land in the creek basin, formerly used for agriculture, has recently begun to develop extensively for residential, commercial and industrial use. Portions of the developed area are subject to annual flooding by overflow from the creek and, about once in 8 years, may be flooded by Genesee River flows across the low divide between the river and the creek. A Corps of Engineers flood control dam was constructed on the river about 55 miles upstream at Mount Morris, New York, and went into operation in November 1951. Since that date, two floods from the uncontrolled area below the dam have caused backwater flooding in the lower creek basin and more serious floods are anticipated.

35. OATKA CREEK

The Oatka Creek drainage basin is located in Western New York and is the principal western tributary to the Genesee River. The total drainage area of the basin is 215 square miles. Oatka Creek rises in the hilly area of Wyoming County about 9 miles south of the village of Warsaw. From the headwaters through Warsaw, the stream flows through a narrow valley. The natural slope of the stream bed at Warsaw is about 22 feet per mile. The drainage area at Warsaw, which is located near the headwaters of the stream, is about 40 square miles. In the drainage area

above Warsaw, topography is rough and hilly; valleys are narrow and slopes are steep. A tributary known as Crystal Brook that has a drainage area of 10 square miles (included in the 40 square miles) joins Oatka Creek in the village downstream from the South Main Street bridge. Plate F18 shows the locations of the areas mentioned above.

36. The valley floor of Oatka Creek in the vicinity of Warsaw ranges in width from about 2000 to 3000 feet. The village of Warsaw is situated along both banks of the creek and occupies most of the valley floor. Areas subject to flooding lie along both banks of the creek from above Allen Street to West Court Street. There has been no flooding reported as caused by Crystal Brook, but areas near the mouth of that brook were flooded by Oatka Creek. The flooded area includes residences, commercial buildings, light manufacturing enterprises, a school and vacant land. Plate F18 shows the flooded outline of the 1955 flood, approximately a 30-year flood.

37. A Detailed Project Report For Flood Control for Oatka Creek at Warsaw, New York has been completed by the Corps of Engineers, Buffalo District in 1965 and a summary of this report is given in paragraph F58. The data used in this report for Oatka Creek are taken from the above mentioned report. For a more detailed analysis of the data used reference should be made to the report on Oatka Creek mentioned above. Construction of this project has begun and its completion is scheduled for 1968.

38. DYKE CREEK

Dyke Creek drains a fan shaped area of about 72 square miles. The village of Andover is at the junction of its two principal branches 9 miles east of Wellsville. The creek rises in Steuben County at an elevation of 2,280 feet and flows westward to enter the Genesee at an elevation of about 1,500 feet. The creek has an average slope of 20 feet per mile for the lower 9 miles. The lower valley has an average width of ½ mile and the steep hills flanking the creek contain many small, flashy tributaries.

39. Improvements on Dyke Creek have been justified and recommended along with improvements on the Genesee River in a Design Memorandum report dated April 1966 on the Genesee River in the village of Wellsville, New York. The construction of this project is dependent on the authorization and allocation of funds by Congress. Stage damage curves for Dyke Creek taken from the Wellsville report are shown on the plates in the attachment to this appendix.

40. CONESUS LAKE

Conesus Lake is situated about 22 miles due south of Rochester in the towns of Conesus, Geneseo, Groveland and Livonia, all of which are located in Livingston County, New York.

41. The Conesus Lake basin consists of an area of 69 square miles, including the lake surface, which drains through Conesus Creek to the Genesee River. The basin is a north-south valley, roughly rectangular in shape, having an average width of 5 miles and a length of about 17 miles.

42. The runoff from the watershed is passed directly to Conesus Lake by overland flow from the steep valley slopes and by numerous small tributaries of relatively short length. The runoff from the watershed is quite flashy due to the absence of natural upland storage capacity and due to the relatively high surface gradient.

43. Flooding that affects cottages, docks, and grounds around Consus Lake and its outlet has generally been reported in the spring and is caused by a combination of high water and ice jams. The largest reported flood on Conesus Lake occurred in March 1956, when approximately 1300 cottages were affected by the high water. A survey by the Corps of Engineers in 1966 indicated that a recurrence of the March 1956 flood would cause approximately $20,000 in damages. Average annual damages from flooding on Conesus Lake are approximately $2,500. Exhibits 9 and 10 show typical flood conditions around cottages surrounding Conesus Lake during the March 1956 flood.

44. HONEOYE LAKE

Honeoye Lake is situated on the northern edge of the Allegheny Plateau and has a drainage area of 41.1 square miles. The lake is about 4.5 miles long and 0.5 to 0.8 miles wide, with a water surface area of 1700 acres. The lake lies in a deep valley, having a lake level of elevation 803 and surrounding hills as high as elevation 2200 feet above mean sea level. The outlet of the lake is in the northwest corner through Honeoye Creek, which empties into the Genesee River at Golah, New York.

45. A preliminary survey of possible recurring damages along the perimeter of Honeoye Lake was conducted by the Corps of Engineers, Buffalo District in the summer of 1966. The results of this survey showed 10 of the 800 cottages to have minor recurring damages up to an elevation of approximately 807.5. The maximum lake stage that could be recalled by local residents was about 806. This lake stage of 806 occurred in 1950 and caused several thousand dollars worth of damage. However, the overwhelming majority of the damage claimed for the 1950 flood was in relocating sewage facilities to higher ground, which is now a nonrecurring damage.

Photo No. 17. Damage from high stages of Conesus Lake during the March 1956 flood.

Photo No. 18. Same as Photo No.

Photo No. 19. Damages from high stages of Conesus Lake during the March 1956 flood.

Photo No. 20. Same as Photo

DAMAGES

46. GENERAL

Damage surveys throughout the Genesee Valley were conducted on the mainstem of the Genesee River and along the tributaries downstream of Mount Morris by the Corps of Engineers. Damage estimates for the tribuatry areas upstream of Mount Morris and in the agricultural damage areas on the tributaries downstream of Mount Morris were developed by the Soil Conservation Service of the Department of Agriculture.

47. DAMAGE SURVEYS IN SUBWATERSHEDS

Damage surveys were conducted at various times throughout the period of the study for those areas giving evidence of past or potential flood damages. More intensive investigations were made in those rural areas having the greatest level of damages. Effort was concentrated on the areas in the upstream subwatersheds showing building and residence damage since the small quantity of upstream bottomland rendered strictly agricultural damages almost negligible in many cases. Known highwater marks were correlated with the flood or floods of record. No damages were evaluated in any reaches where land use encompassed a majority of pastureland or other nonintensive uses.

48. DAMAGE SURVEYS CORPS OF ENGINEERS

A damage survey for a recurrence of the 1950 and 1956 floods throughout the Genesee River basin was conducted in August 1964. The survey by Corps of Engineers personnel included all types of direct damages and the separation of recurring and non-recurring damages. Lack of data for a storm that affected the entire Genesee Basin was the reason that two different floods, one in the lower basin and one in the upper basin, were used as a reference for damages. Flood outlines along the Genesee River are shown on plates F3-F13. Units, acres and miles of highway within the 50-year flood outline along the Genesee River are given in table F3.

49. For Canaseraga Creek the damage survey was made in the same manner. The amount of acreage and roads that was inundated by the April 1961 flood was used to compute damages. The flooded outline of the April 1961 flood along Canaseraga Creek is shown on plates F14-F15.

50. DAMAGES IN THE RURAL AREAS OF THE SUBWATERSHEDS

No damages were evaluated in any agricultural reaches where pasture or other non-intensive uses constituted the major portion

TABLE F3. - Approximate number of units, acres and miles of highway within the 50-year flood outline (1)

Reach	Residential	Commercial	Utility and Public	Total Units	Acres	Approximate miles of highway
Rochester 1	-	-	-	-	-	-
Chile 2 (2)	209	3	1	213	1600	10
Henrietta 2 (3)	192	66	2	260	2500	NA
Avon 3	-	-	-	-	1050	1
Geneseo 4	-	-	-	-	650	-
Mount Morris 5 (4)	-	-	-	-	-	-
Portageville 6	6	-	-	6	700	3
Fillmore 7	6	-	-	6	750	1
Belfast 8	-	-	-	-	450	1
Belvidere 9	2	-	-	2	200	-
Belmont 10	10	4	1	15	150	-
Scio 11	56	5	-	61	150	-
Wellsville 12	(5) 257	(5) 57	(5) 6	(5) 320	(5) 450	(5) 4

Reach	Residential	Commercial	Utility and Public	Total Units	Acres	Approximate miles of highway
Stannards Corners 13	5	4	-	9	50	1
Shongo 14	7	1	1	9	150	2
Pennsylvania 15	NA	NA	NA	NA	NA	NA
Total	731	131	11	899	8850	27

- None

(1) Conditions of development as of August 1964

(2) Includes the left bank only, the right bank is given in detail in the Interim Report for Flood Control, Red Creek, New York dated 1965

(3) From detailed report for Flood Control on Red Creek - 100-year flood outline

(4) Mount Morris reservoir and Letchworth State Park

(5) Detailed information on floods and protection is given in the Design Memo Report dated 1966. Figures are based on existing project conditions

of the floodplains. Detailed damage studies were made for the following agricultural reaches in addition to Canaseraga Creek: The floodplain on Cryder Creek between Painsville and Whitesville, two floodplain reaches between Angelica and Birdsall and two reaches along Oatka Creek below Warsaw to the hamlet of Pearl Creek. In addition, flood damages were determined for the communities of Whitesville on Cryder Creek, Friendship on Van Campen Creek, Angelica on Angelica Creek and Bliss on Wiscoy Creek. Frequency of damaging floods and the types of damages incurred are shown in table F4.

TABLE F4. - Frequency of Out-of-Bank Flows and Type of Damage in Rural Areas of the Subwatersheds (1)

Subwatershed No.	Subwatershed Name	Location	Chance of Occurrence on an Annual Basis	Type of Damage
1.	Genesee South	Genesee	10%	Residential
2.	Cryder Creek	Whitesville	14%	"
	Cryder Creek	Whitesville	100%	Agricultural
4.	Dyke Creek	Andover	1%	Residential
6.	VanCampen Creek	Friendship	20%	"
7.	Angelica Creek	Angelica	14%	"
	Angelica Creek	Black Creek	100%	Agricultural
	Angelica Creek	Baker Creek	33%	"
11.	Wiscoy Creek	Bliss	100%	Residential
	Wiscoy Creek	Pike	25%	"
13.	Canaseraga Creek	Canaseraga Valley	100%	Agricultural
18.	Oatka Creek	Warsaw	100%	"

(1) Location of subwatersheds are shown on plate F23

51. STAGE-DAMAGE CURVES

A profile for the 50-year flood and historical flood profiles were used to reference damages at individual properties to flood stages at the index points within the reaches. In this way the elevation of several historical and hypothetical floods were converted to a damage which would occur as the result of a given stage at an assigned index point. Table F5 lists the damages at each index point for the 10-, 20- and 50-year hypothetical floods and two historical floods.

52. Stage-damage curves for Canaseraga Creek were developed and used with derived frequency curves to calculate the average annual damages per reach. Table F6 lists approximate average annual damages at each index point for the 10-, 20- and 50-year hypothetical floods, and the April 1961 flood. More detailed damage values for the Canaseraga Valley are given in appendix C.

TABLE F5. - Estimated damages on the Genesee River for August 1964 price level and conditions, also average annual damages (1)

Reach		Average Annual Damages $	Damages $ Recurrence Interval in Years 10	20	50	Historical Floods Damage $	1956 (2)	Discharge cfs	Damage $	1950 (2)	Discharge cfs
Rochester 1		5,000	--	--	--	--					
Chili 2	(3)	16,850	76,000	119,000	146,000	67,500	12	24,100			
Henrietta 2	(4)	24,650	30,800	92,500	168,100	NA					
Avon 3		5,750	11,600	13,800	14,800	5,850	14	20,000			
Geneseo 4		450	1,550	3,100	4,550	0	14	15,600			
Mt. Morris 5		None	--	--	--						
Portageville 6		1,650	7,950	9,700	10,900				6,750	10	31,900
Fillmore 7		2,250	5,150	6,350	7,350				5,750	10	26,200
Belfast 8		500	2,650	3,550	4,450				2,100	12	25,400
Belvidere 9		350	800	1,000	1,250				1,000	25	24,700
Belmont 10		700	1,750	2,800	5,750				5,750	40	24,400
Scio 11		5,300	11,250	15,850	22,750				27,650	50	23,300
Wellsville 12		23,800	29,200	42,300	96,700				96,700	50	21,500
Stannards Corners 13		2,400	4,450	7,000	10,000				14,400	125	20,000
Shongo 14		2,450	3,800	8,700	17,300				31,000	125	18,600
Pennsylvania 15		(6)									

(1) Reaches 1-4 are with the Mount Moris Dam in operation.
(2) Recurrence Interval in years.
(3) Damages only on the left bank.
(4) Damages on the right bank as stated in the report on Flood Control for Red Creek, only raised by price level.
(5) Damage reported in Design Memorandum on Flood Control for Wellsville, for existing project conditions.
(6) Overall damages are minor.

TABLE F6. - Estimated damages on Canaseraga Creek for August 1964 price levels and conditions, also average annual damage.

Reach	Average Annual Damages	Damage Recurrence interval in years 10	20	50	April 1961 flood Damages	Recurrence interval in years
1	33,520	61,000	66,000	70,000	NA	5
2	34,380	41,800	42,500	42,800	15,750	8
3	25,740	43,500	46,500	49,000	9,500	8

53. AVERAGE ANNUAL DAMAGE

State-damage curves and appropriate frequency curves were used to compute a damage-frequency relationship for each reach. The estimated average annual damage, derived from the damage frequency relationship for each reach at August 1964 price levels, are shown in Table F7. Damage-frequency curves are shown on plates F7A-F9A of the attachment.

54. AVERAGE ANNUAL DAMAGES TO RURAL DEVELOPMENTS IN THE SUBWATERSHEDS.

Average annual damages to residential and agricultural properties in the subwatersheds were determined through the use of the standard stage-damage-discharge-frequency analysis, where the area under the damage-frequency curve yields the level of average annual damages for current conditions. These curves are developed and shown in "Economic Documentation - Subwatersheds, Genesee River Basin Study," on file with the USDA Soil Conservation Service, Syracuse, New York. The average annual damages resulting from flooding in the subwatersheds are shown in table F7.

TABLE F7. - Estimated direct average annual flood damage August 1964 price level to subwatersheds within the Genesee Basin

Reach main stem Genesee	Tributary	Sub-water shed	Average annual damage	Reach total
Rochester		20		
1	main stem		$ 5,000	$ 5,000
Chili				
2	2a - Black Creek	19	16,850	
	$2b_1$ - Red Creek		400	
	$2b_2$ -		300	
	$2b_3$ -		100	
	$2b_4$ -		13,500	
	$2b_5$ -		200	
	$2b_6$ -		10,550	
	$2b_7$ -		1,250	43,150
Avon				
3	main stem	18	5,750	
	3a - Oatka Creek		4,500	
	$3a_2$ -		39,200	
	3b - Honeoye Creek	17	3,000	52,450
	3c - Honeoye Lake	17	2/	
Geneseo				
4	main stem		450	
	Conesus Lake	16	2,500	
	4a - Conesus Creek	16	2/	
	4b - Keshequa Creek	13	3,000	
	$4c_1$ - Canaseraga Creek	13	33,520	
	$4c_2$ -		34,380	
	$4c_3$ -		25,740	99,590
Mount Morris				
5			2/	2/
Portage-ville				
6	main stem		1,650	
	6a - Wiscoy Creek	11	3,000	4,650
Fillmore				
7	main stem		2,250	
	7a - Cold Creek	10	2/	
	7b - Rush Creek	10	2/	
	7c - Canadea Creek	9	2/	2,250
Belfast				
8	main stem		500	
	8a - Crawford Creek	8	2/	
	8b - Black Creek	8	2/	
	8c - White Creek	8	2/	
	8d - Angelica Creek	7	7,800	8,300

TABLE F7. (Cont'd)

Reach main stem Genesee	Tributary	Sub-water-shed	Average annual damage	Reach total
Belvidere				
9	main stem		$ 350	
	9a - Van Campen Creek	6	1,230	$1,580
Belmont	main stem		700	
10	10a - Phillips Creek	5	2/	700
Scio	main stem		5,300	
11	11a - Knight Creek	5	2/	
	11b - Vandermark Creek	5	2/	5,300
Wellsville				
12a			370	
12b			330	
12c			2,160	
12d			2,480	
12e			3,360	
12f			6,300	
	12g - Dyke Creek	4	4,210	
	12h		2,950	
	12i		40	
	12j		1,600	23,800
Stannards Corners				
13	main stem		2,400	
	13a - Chenunda Creek	3	2/	2,400
Shongo				
14	main stem		2,450	2,450
	14a - Cryder Creek	2	3,990	3,990
Pennsylvania				
15			2/	

1/ Location of subwatersheds are shown on plate F23.

2/ Damages not significant enough to evaluate or report.

FLOOD CONTROL IMPROVEMENTS WITHIN THE GENESEE RIVER BASIN

55. GENERAL

Throughout the Genesee River basin several plans of improvements ranging from local protection projects to multiple purpose reservoirs, were considered to obtain the maximum flood control benefits in the damage areas. This preliminary plan of improvement study revealed that in the majority of reaches local flood control projects were not feasible because of the relatively small amount of average damages combined with flooded areas that are sporadically located over several miles. However, the plan of improvement study did consider the effects of fourteen reservoir sites, and several local protection projects. Each of the improvements are discussed in subsequent paragraphs.

56. RECOMMENDED LOCAL PROTECTION IMPROVEMENTS BY THE CORPS OF ENGINEERS

Areas where reports have been completed and where local flood control projects have been justified and recommended are: Red Creek in the towns of Brighton and Henrietta, Oatka Creek in the village of Warsaw and the Genesee River, including Dyke Creek, in the village of Wellsville. A summary of the improvements for the recommended projects mentioned above is given in subsequent paragraphs.

57. For Red Creek the most practicable plan of improvement included channel enlargement and realinement of the creek channels, construction and modification of bridges, and a levee along the Genesee River to prevent overland flow into the protected area of Red Creek, against flood stages with a recurrence interval of 100 years. Benefits from flood damage reduction that would be derived from the recommended improvement on Red Creek are given in table F8. Other benefits, such as those derived from future development and enhancement, can be found in the interim report mentioned above. Although the Red Creek project is economically justified and has been recommended by both the Buffalo District, and the Office of Chief Engineers, actual construction of the project will depend on certain conditions of local cooperation. This project is expected to be completed in approximately 5 years.

58. The project plan for Oatka Creek consists of channel enlargement with crib retaining walls where space is not available for earth side slopes. There will be a drop structure at the upstream limit of the project to provide for the dissipation of energy. The project plan was designed to provide without freeboard a nondamaging channel capacity of 4,500 cfs, which is estimated to recur once in 30 years and is the maximum capacity of existing bridges. Flood control benefits for the above plan of improvement are given in table F8. Detailed information concerning the Oatka Creek area can be found in the Design Memorandum Report on Flood Control, Oatka Creek, Warsaw, New York. Completion of this project was scheduled for fall of 1967.

59. A local flood protection project consisting mainly of channel improvement was completed in 1957 on the Genesee River, including Dyke Creek, in the village of Wellsville. Based on the discharge history since the construction of the existing project and the revised frequency relationship, a study to increase the capacity of the existing project was undertaken. This study now completed by the Buffalo District, recommended the existing project be enlarged to contain the following flood flows:

Genesee River, below Dyke Creek	21,500 cfs
Genesee River, above Dyke Creek	17,300 cfs
Dyke Creek	7,300 cfs

These design discharges have about a two percent chance of occurrance. Flood control benefits for the latest recommended Wellsville project are given in table F8.

TABLE F8. - Estimated average annual flood control benefits to existing devèlopment, from recommended local protection projects, August 1964 price levels and conditions

Stream	Location	Average annual damage natural development	Average annual damage, improved conditions	Total flood control benefits
Red Creek	Tn. Henrietta	26,300	4,250	22,050
Genesee River	Wellsville	76,450	6,800	69,650 (1)
		15,000	6,800	8,200 (2)
Dyke Creek	Wellsville	48,150	6,900	41,250 (1)
		8,800		1,900 (2)
Oatka Creek	Warsaw	43,700	3,550	40,150

(1) These benefits are based on the increase in the capacity of the channel from natural conditions to the project plan conditions.

(2) These benefits are based on the increase in the capacity of the channel from existing conditions to the project plan conditions.

60. CONSIDERED LOCAL PROTECTION IMPROVEMENTS

A local protection project being considered in the Genesee River Basin is Canaseraga Creek (plates F14-F15) in Livingston County.

61. A study of possible improvement for flood control on Canaseraga Creek is underway, although a preliminary plan of improvement, consisting of channel enlargement combined with a gated retention structure has been developed, benefits for this improvement have not been finalized.

62. OTHER CONSIDERATIONS

An area in the Genesee River Basin that has experienced a steadily increasing amount of flood damage is the surrounding area at the confluence of Black Creek and the Genesee River, in the town of Chili. Although several plans of improvement were considered, including channel widening and levees on both Black Creek and the Genesee River, no improvement plan could provide a greater amount of annual benefits (including future development) than the corresponding annual cost of the considered project. Average annual flood damages fromthe Black Creek area are shown in table F5. This average annual damage value contains flood damages, and damages that could be derived from future development. These benefits were not sufficient to justify any improvement project, therefore other limitations to the increase in flood damage should be considered.

63. A realistic solution to the reduction of future flood damages in the Black Creek area would be for local authorities to prevent further construction of residential or commercial developments within the flood areas. In recent years there has been an increase by local governments in the use of flood plain regulation through zoning ordinances as a method of preventing future flood damages. Ideally flood plain regulation permits expensive development only in those areas which suffer no or very infrequent flooding and recommends the flood plain area for use as parks, recreation areas, wildlife refuges and other low damage developments.

64. Past experience has shown that in spite of the tremendous expenditure for flood control projects, the average annual flood damage throughout the country is increasing steadily because of continued development in flood plain areas. Many areas exist where individual damages are high but overall damages are not sufficient to justify an improvement project. This means that development in a flood plain area may suffer considerable damage before protection can be justified, if ever, and in the meantime the value of the original development is considerably reduced.

65. Under the provisions of Section 206, Public Law 86-645 (Flood Control Act of 1960) Congress has authorized the Corps of Engineers to compile and disseminate information on past floods and possible flood damage in order to serve as a guide to future development and a basis for avoiding future flood hazards. A number of localities of New York State have made application through the New York State Department of Public Works in order to obtain a flood plain information study in their area. The studies will be used to develop a regulation plan for development which will control land use within the flood plain. The regulatory controls should provide for the optimum use of the area with the minimum risk of flood damage. The actual regulation of the flood plain must be done by the local governing agencies. Minimum allowable structure elevations should be a specific height above the flood elevations of past floods. The best solution to the increasing flood damages of the Black Creek-Genesee River area would be a flood plain information study that would enable the town of Chile officials to regulate the flood plain. A general discussion of guidelines for flood plain regulations and flood proofing practices is given in the attachment.

66. In the subwatersheds approximately 200 structures were examined with respect to their potential for main stem and subwatershed flood control as well as for other multiple purpose uses. Of these structures, 19 were selected as offering significant preliminary flood control benefits. The preliminary benefits assigned to these structures are shown in table F9. Their detailed location within the Genesee River Basin is shown in "Engineering Documentation - Subwatersheds, Genesee River Basin Study" on file with the USDA Soil Conservation Service, New York. Their general location within the Genesee River Basin is shown on plate F24.

TABLE F9. - Flood Control Structures and Associated Flood Damage Reduction Benefits in the Subwatersheds.

Subwatershed	Structure No.	Ave. Ann. Flood Reduction Benefits
Genesee South 1/	1-5, 1-7)	
Cryder Creek	2-10)	$31,020
Cryder Creek	2-6	3,190
Van Campen Creek	6-3, 6-5, 6-6	1,230
Angelica Creek	7-3, 7-7	4,230
Canaseraga Creek 2/	$13\text{-}C_1$, or $13\text{-}C_2$, 13-1 2, 3, 5, 8A, 22	78,180
Oatka Creek 3/	$18\text{-}C_1$, or $18\text{-}C_2$	6,000/3,940

1/ This structural system duplicates those benefits claimed for Genesee River - Wellsville in Table F8, page 43, and the two are not additive.

2/ Two structural systems were analyzed here; one consisting of a channel, the other of a channel and supporting reservoirs. Both systems duplicate the control offered by Dam No. 12 on Table F10, page 50 and are not additive.

3/ Two separate channel designs were analyzed for this agricultural area below the village of Warsaw. The controlled area is entirely separate from the Oatka Creek area analyzed in Table F8 on page 43.

67. RESERVOIRS

Throughout the Genesee basin a total of 14 sites were selected by the U. S. Army District, Buffalo as the best possible locations with sufficient storage for either a flood control or multiple purpose reservoir. The approximate location of each reservoir site is shown on plate F25. Preliminary flood control benefits for each reservoir site were derived by assuming each reservoir would impound any flood discharge above the dam and the flow downstream of the dam of a given flood frequency would then be reduced. Preliminary flood control benefits

that would be attributed to each of the 14 considered reservoir sites are shown in table F10. For these preliminary benefits each reservoir was assumed to control the entire runoff from the drainage area upstream of the reservoir site. Preliminary flood control benefits computed for a selection of the most desirable reservoir sites are described in the attachment.

68. FLOOD WARNING AND FORECASTING SERVICES

The U. S. Weather Bureau, Rochester Airport Station, has established a flood forecasting system for the Genesee Basin, which includes Weather surveillance Radar Equipment that provides for early detection and plotting the predicted path of heavy precipitation. The Weather Bureau also has arrangements to make radio and broadcasts of potential heavy storms. A section on flood warning and forecasting services by the U. S. Weather Bureau, Rochester Airport Station is given in the attachment to this appendix.

TABLE F10 - Estimated average annual flood control benefits to existing development, from considered reservoirs, August 1964 price levels

Dam No.	Site	Stream	Drainage area sq. miles	Reach No. (1)	Average annual damages existing conditions	Average annual damage improved conditions	Flood control benefits to reaches	Total average annual flood control benefits for each resevoir
1	Stannard	Genesee	168	13	$ 2,420	$ 130	$ 2,290 (2)	
				12	23,800	1,660	22,140	
				11	5,290	1,210	4,080	
				10	690	80	610	
				9	360	180	180	
				8	520	250	270	
				7	2,260	1,330	930	
				6	1,670	910	760	$31,260
2	Chenunda	Chenunda	29	13	2,420	1,990	520	
				12	23,800	14,800	9,000	
				11	5,290	4,460	830	
				10	690	500	190	
				9	360	330	30	
				8	520	450	70	
				7	2,260	2,150	110	
				6	1,670	1,520	150	10,900
3	Vander-mark	Vander-mark	- 20					
				20	5,290	4,720	570	
				10	690	550	140	
				9	360	340	20	
				8	520	470	50	
				7	2,260	2,150	110	
					1,670	1,570	100	990
4	Angelica	Angelica	54	(3)	(4) 7,800	(5) 0	7,800	
				9	360	300	60	
				8	520	410	110	
				7	2,260	1,900	360	
				6	1,670	1,390	280	8,610
5	Summit	Black	20	(3)	(4) 7,800	(6) 3,900	3,900	
				8	520	460	60	
				7	2,260	2,150	110	
				6	1,670	1,490	180	4,250
6	Belfast	Genesee	580	8	520	0	520	
				7	2,260	0	2,260	
				6	1,670	80	1,590	4,370
7	Cold	Cold	40	7	2,260	2,090	170	
				6	1,670	1,370	300	470
8	Rush	Rush	39	7	2,260	1,930	330	
				6	1,670	1,350	320	650

TABLE F10 - (Contd)

Dam No.	Site	Stream	Drainage area sq. miles	Reach No. (1)	Average annual damages existing conditions	Average annual damage improved conditions	Flood control benefits to reaches	Total average annual flood control benefit for each reservoir
9	Wiscoy	Wiscoy	108	(7)	$ 3,000(4)	$ 0(5)	$ 3,000	$ 3,530
				6	1,670	1,140	530	
10	Portage	Genesee	985	(8)				
11	Tuscarora	Keshequa	68	(9)				
				1	33,520	22,670	10,850	
				2	34,380	32,450	1,930	
				3	25,740	22,060	3,680	16,460
12	Poags Hole	Canaseraga	87	(9)	33,520	17,830	15,690	
				1	34,380	23,000	11,380	
				2	25,740	22,420	3,320	30,390
13	Honeoye	Honeoye	189	(10)				
14	Oatka	Oatka	188	3	8,000	3,650	4,350(11)	4,350

(1) Because of the location of Mount Morris Reservoir, damsites 1-10, which are above Mount Morris, would only benefit reaches 6-13. The reach numbers given for each damsite are the reaches that would benefit from the stated reservoir site.

(2) Benefits are attributed to the reservoir site only and are based on the existing project as of August 1964. Also includes sub reaches along Dyke Creek.

(3) This reach extends from the confluence of Angelica Creek and the Genesee River to the considered Angelica damsite.

(4) This value was computed by the Soil Conservation Service to be the approximate average annual damage in this reach.

(5) Considering the effect of the considered damsite to the damage area, it was assumed that no average annual damage would exist after completion of the dam.

(6) Considering the distance of the considered damsite to the damage area, it was assumed that 50 percent of the average annual damage would be eliminated.

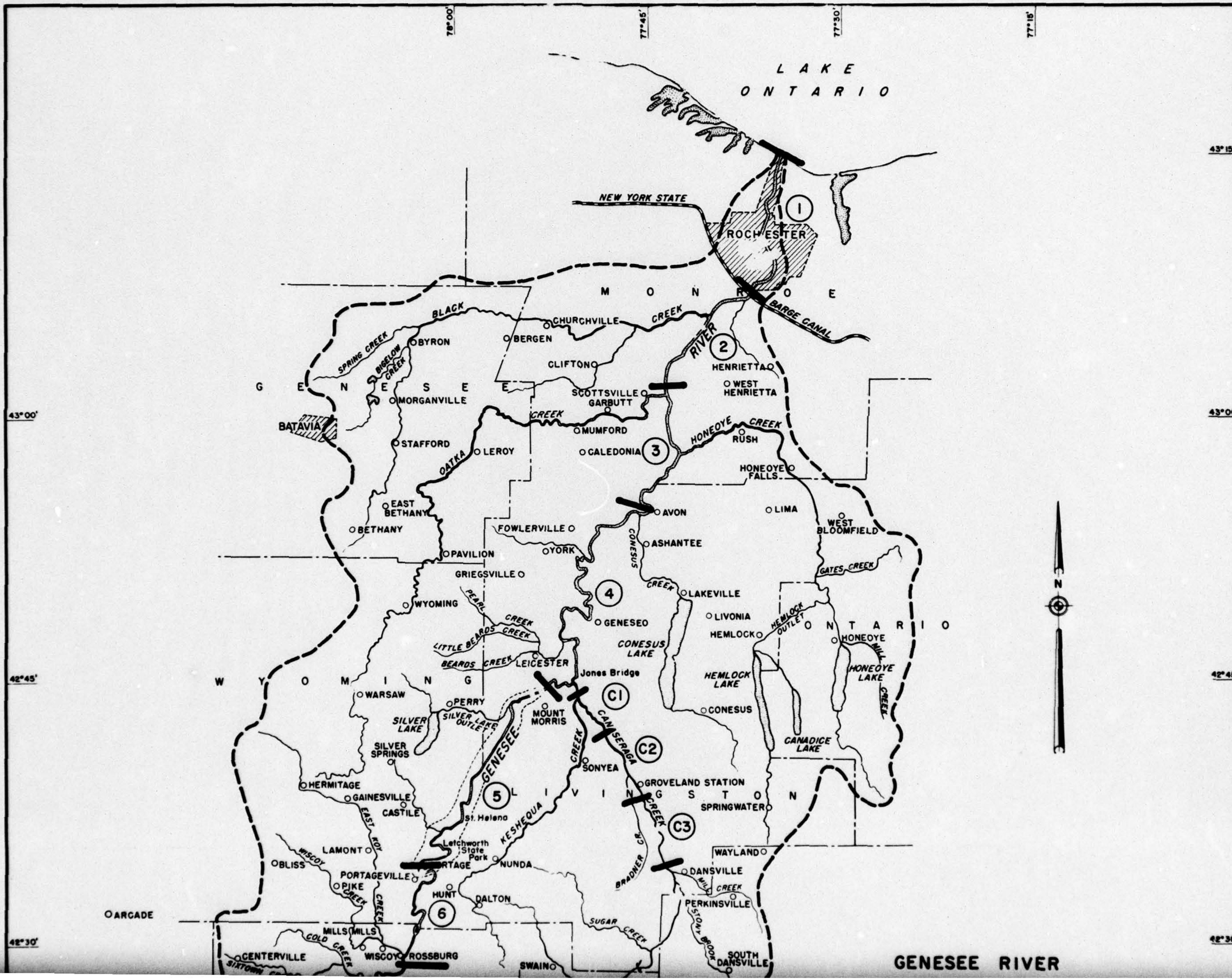
(7) This reach extends from the confluence of Wiscoy Creek and the Genesee River to the considered Wiscoy Creek Damsite.

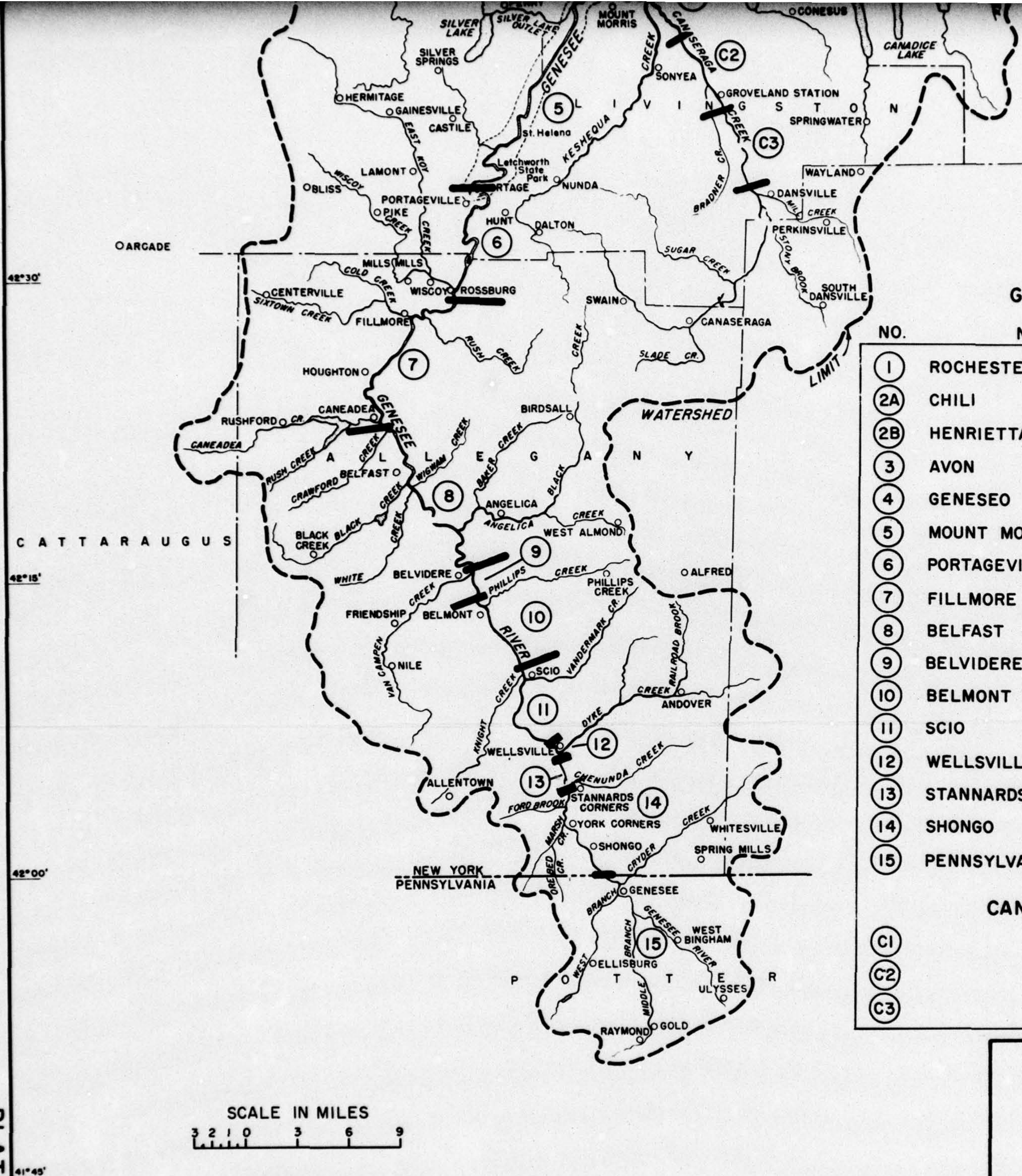
(8) Because of the nearness to the Mount Morris Reservoir, no flood control benefits could be derived for this considered reservoir site.

(9) Benefits to the Canaseraga Creek only.

(10) Reservoir capacity is inadequate for any amount of flood control storage, therefore, no flood control benefits could be derived.

(11) Benefits are applicable to the reduction of flow into the main stem of the Genesee River and thus a reduction in backwater on the Black Creek from the Genesee River.


LAKE ONTARIO
NEW YORK STATE
ROCHESTER
BARGE CANAL
MONROE
GENESEE
WYOMING
LIVINGSTON
ONTARIO
BATAVIA
BLACK CREEK
SPRING CREEK
BIGELOW CREEK
BYRON
BERGEN
CHURCHVILLE
CLIFTON
MORGANVILLE
STAFFORD
LEROY
OATKA CREEK
EAST BETHANY
BETHANY
PAVILION
SCOTTSVILLE
GARBUTT
MUMFORD
CALEDONIA
HENRIETTA
WEST HENRIETTA
RIVER
HONEOYE CREEK
RUSH
HONEOYE FALLS
AVON
LIMA
WEST BLOOMFIELD
FOWLERVILLE
YORK
ASHANTEE
CONESUS CREEK
GRIEGSVILLE
WYOMING
PEARL CREEK
LITTLE BEARDS CREEK
BEARDS CREEK
LEICESTER
GENESEO
LAKEVILLE
LIVONIA
HEMLOCK
HEMLOCK OUTLET
GATES CREEK
HONEOYE
MILL CREEK
HONEOYE LAKE
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
CONESUS
Jones Bridge
MOUNT MORRIS
WARSAW
PERRY
SILVER LAKE
SILVER LAKE OUTLET
SILVER SPRINGS
GENESEE
CANASERAGA CREEK
SONYEA
GROVELAND STATION
SPRINGWATER
HERMITAGE
GAINESVILLE
CASTILE
EAST KOY CREEK
St. Helena
KESHEQUA CREEK
Letchworth State Park
LAMONT
BLISS
WISCOY
PORTAGEVILLE
PORTAGE
NUNDA
PIKE
BRADNER CR.
WAYLAND
DANSVILLE
MILL CREEK
PERKINSVILLE
HUNT
DALTON
ARCADE
MILLS MILLS
COLD CREEK
CENTERVILLE
SIXTOWN CREEK
WISCOY
ROSSBURG
SWAIN
SUGAR CREEK
STONY BROOK
SOUTH DANSVILLE
1
2
3
4
5
6
C1
C2
C3
N
78°00'
77°45'
77°30'
77°15'
43°15'
43°00'
42°45'
42°30'
GENESEE RIVER



GENESEE RIVER

NO.	NAME	AVE. ANN. DAMAGES
1	ROCHESTER	—
2A	CHILI	16,850
2B	HENRIETTA	26,200
3	AVON	5,750
4	GENESEO	450
5	MOUNT MORRIS	—
6	PORTAGEVILLE	1,650
7	FILLMORE	2,250
8	BELFAST	500
9	BELVIDERE	350
10	BELMONT	700
11	SCIO	5,300
12	WELLSVILLE	23,800
13	STANNARDS CORNERS	2,400
14	SHONGO	2,450
15	PENNSYLVANIA	—
	CANASERAGA CREEK	
C1		
C2		23,650
C3		9,100

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

BASIN MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

PLATE F1

PLATE F1

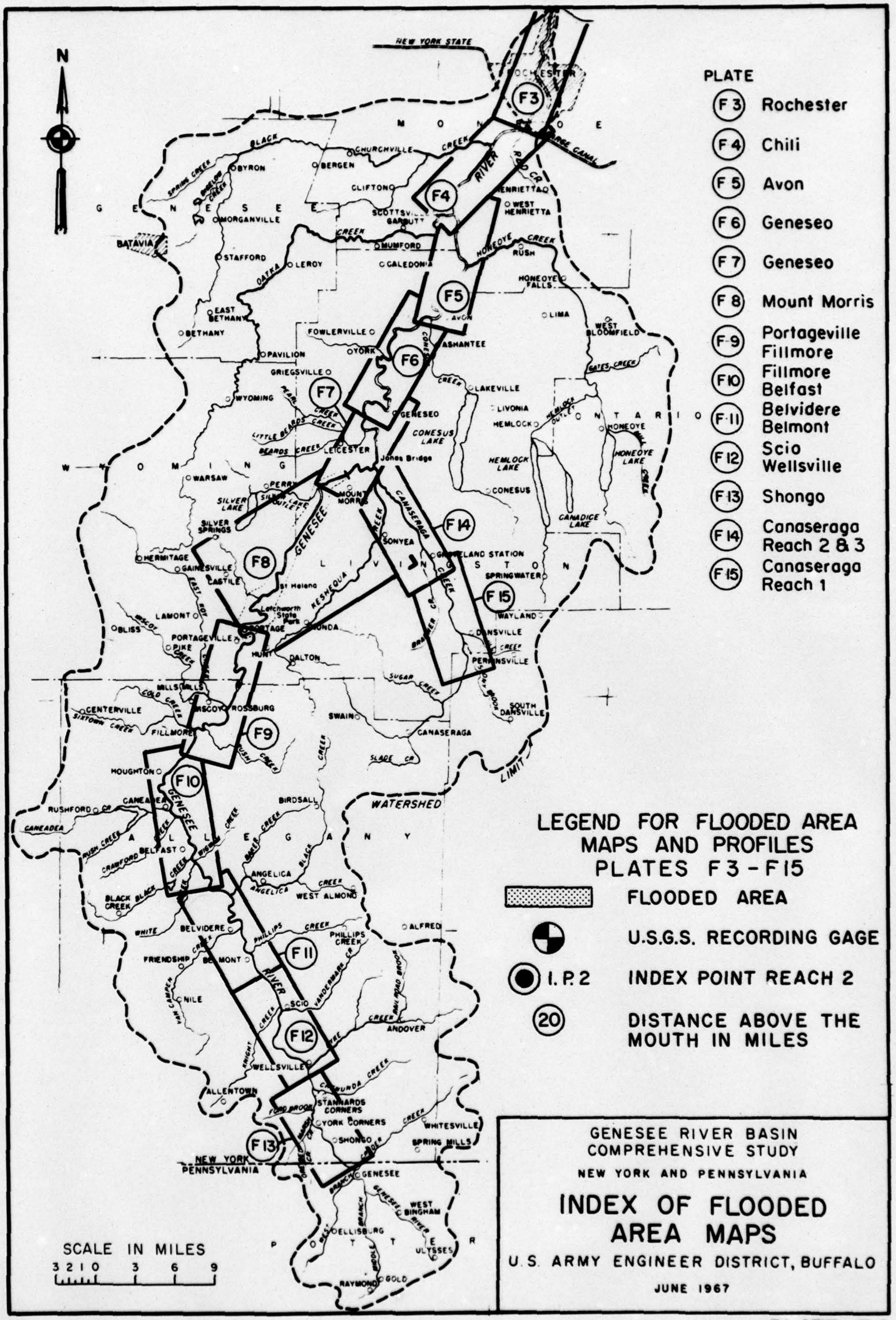


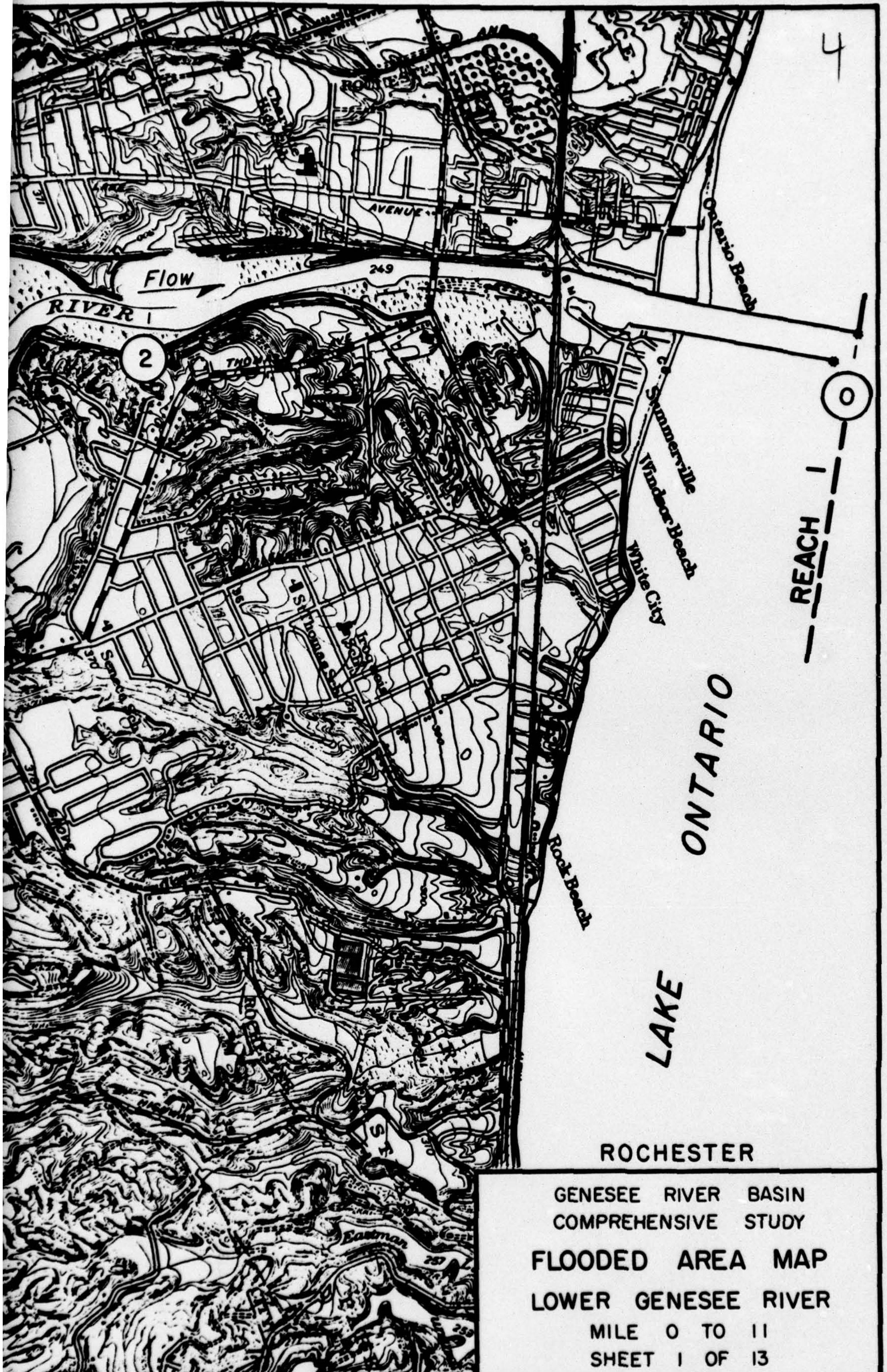
PLATE
F3 Rochester
F4 Chili
F5 Avon
F6 Geneseo
F7 Geneseo
F8 Mount Morris
F9 Portageville Fillmore
F10 Fillmore Belfast
F11 Belvidere Belmont
F12 Scio Wellsville
F13 Shongo
F14 Canaseraga Reach 2 & 3
F15 Canaseraga Reach 1
LEGEND FOR FLOODED AREA MAPS AND PROFILES PLATES F3 - F15
FLOODED AREA
U.S.G.S. RECORDING GAGE
I. P. 2 INDEX POINT REACH 2
20 DISTANCE ABOVE THE MOUTH IN MILES
GENESEE RIVER BASIN COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
INDEX OF FLOODED AREA MAPS
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967
SCALE IN MILES
3 2 1 0 3 6 9
N
NEW YORK STATE
WATERSHED
LIMIT
NEW YORK
PENNSYLVANIA

PLATE F2


NEW YORK STATE
BARGE
CANAL
REACH 2
REACH 1
West High School
Madison School
GENESEE
JEFFERSON
SEWARD
PLYMOUTH
10
8
Flow
GENESEE
VALLEY
RIVER
512
Mt Hope Cem
ERIE
LEHIGH VALLEY


I.P. 1
6
GENESEE PARK
8
RIVER
DRIVING PARK AVENUE
Kodak Park
ST ANNS HOME
DEWEY
NEW YORK
PARKWAY
LANE
NORTH
BASEBALL PARK
NORTON
HUDSON
CLIFFORD
CLINTON
PORTLAND
AVE
STREET
SOUTH
Benjamin Franklin Sch
1000 0 1000 2000 3000 4000 5000 6000


Flow
GENESEE
RIVER
Kodak Park
ST BERNARDS SEMINARY
ST ANNS HOME
DEWEY
LAKE
AVENUE
NEW
YORK
4
2
Rogers Sch
Irondequoit High Sch
Benjamin Franklin Sch
COOPER
ROAD
HUDSON
PORTLAND
KINGS
STREET
1 MILE
4000
5000
6000
7000 FEET



GENESEE RIVER BASIN
COMPREHENSIVE STUDY

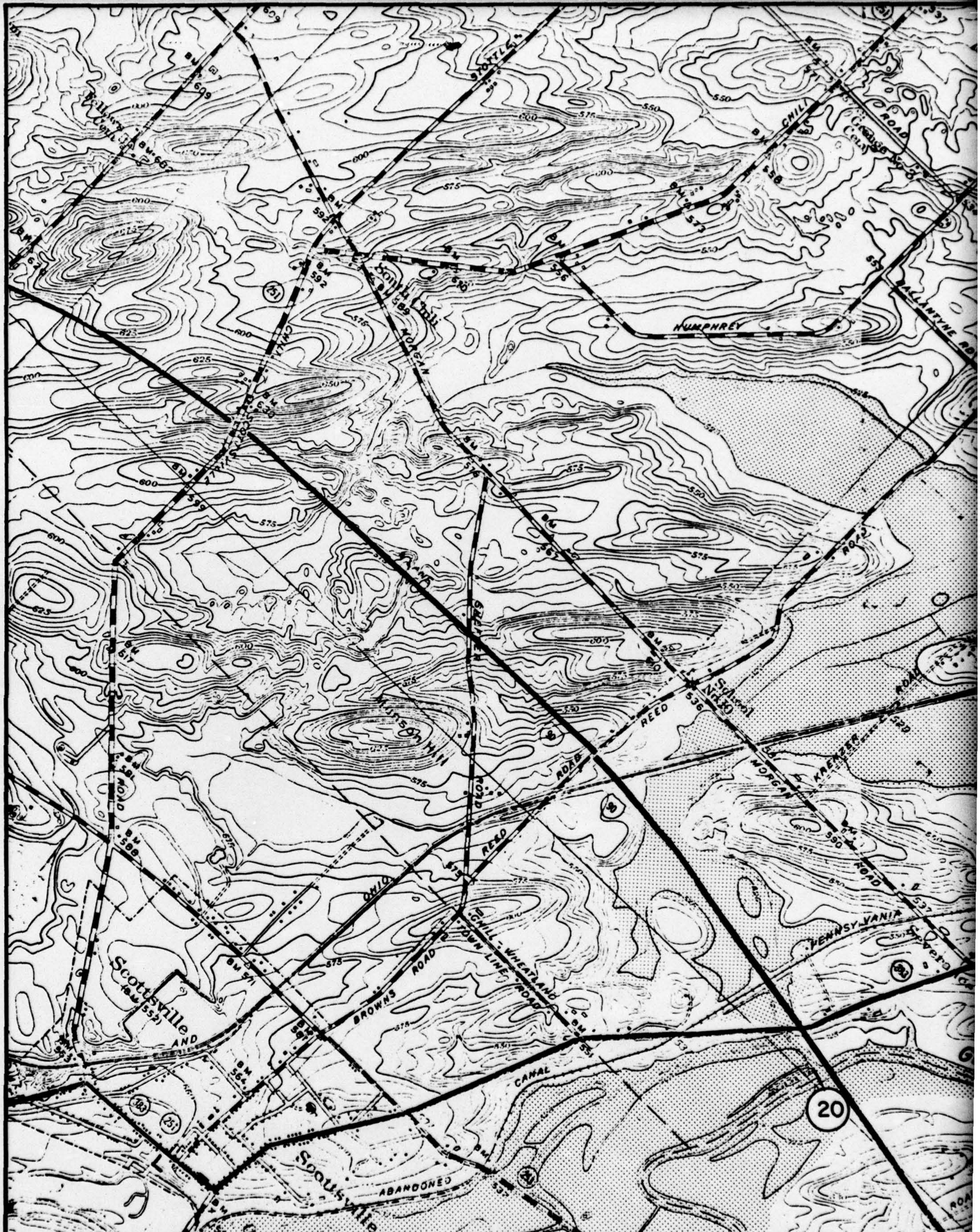
FLOODED AREA MAP

LOWER GENESEE RIVER

MILE 0 TO 11

SHEET 1 OF 13

PLATE F 3



North Chili
HUMPHREY
MORGAN
Munson Hill
REED
ROAD
OHIO
BROWNS ROAD
CHILI - WHEATLAND
TOWN LINE ROAD
KRENZER
Scottsville
AND
CANAL
ABANDONED
20

BLACK
CREEK
C
H
I
L
I
H
ARCHER
NEW
BROOK RD.
BROOK
ROAD
BALLANTYNE
BALLANTYNE RD.
Brookdale
BALTIMORE
AND
ABANDONED
CANAL
SCOTTSVILLE
RTE 383
COATES
ROAD
KREUZER
PENNSYLVANIA
GENESEE
Flow
RIVER
16
18
20
1000
0


I.P. 2
14
GENESEE
Flow
HENRIETTA
BRIGHT
R O
CREEK
OHIO
PENNSYLVANIA
CANAL
SCOTTSVILLE ROAD
RTE 383
RIVER
BRIGHTON HENRIETTA TOWN LINE ROAD
WEST HENRIETTA ROAD
ROCHESTER AIRPORT
BALTIMORE
BLACK CREEK PARK
ALFRED AVE
CHESTER AVE
JENISON RD
CRITTENDEN
TRANSMISSION LINE
HAWTHORNE
EAST RIVER
MAPLE STREET ROAD
STREET
YORK
RED
SHORE
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

4

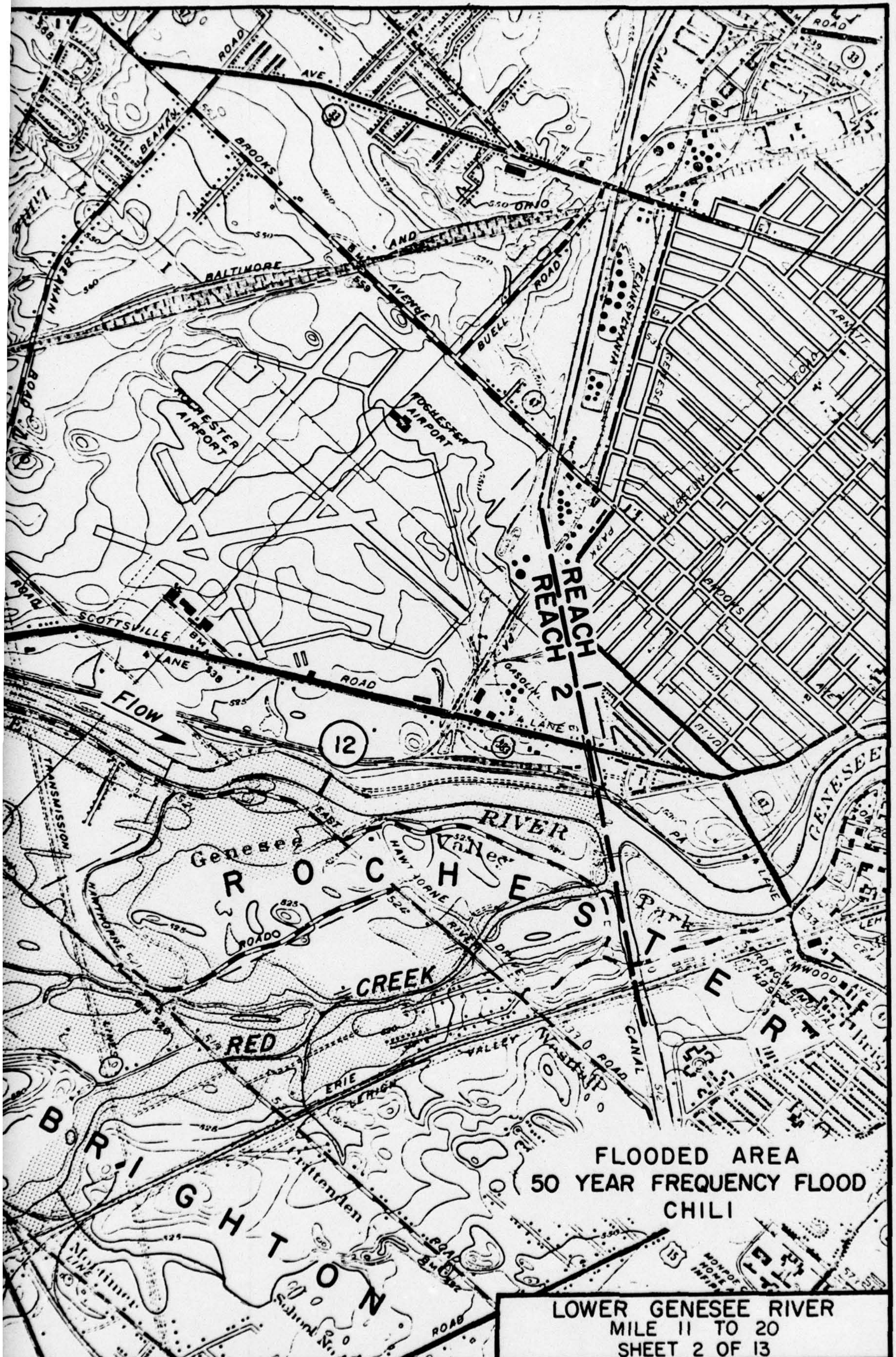
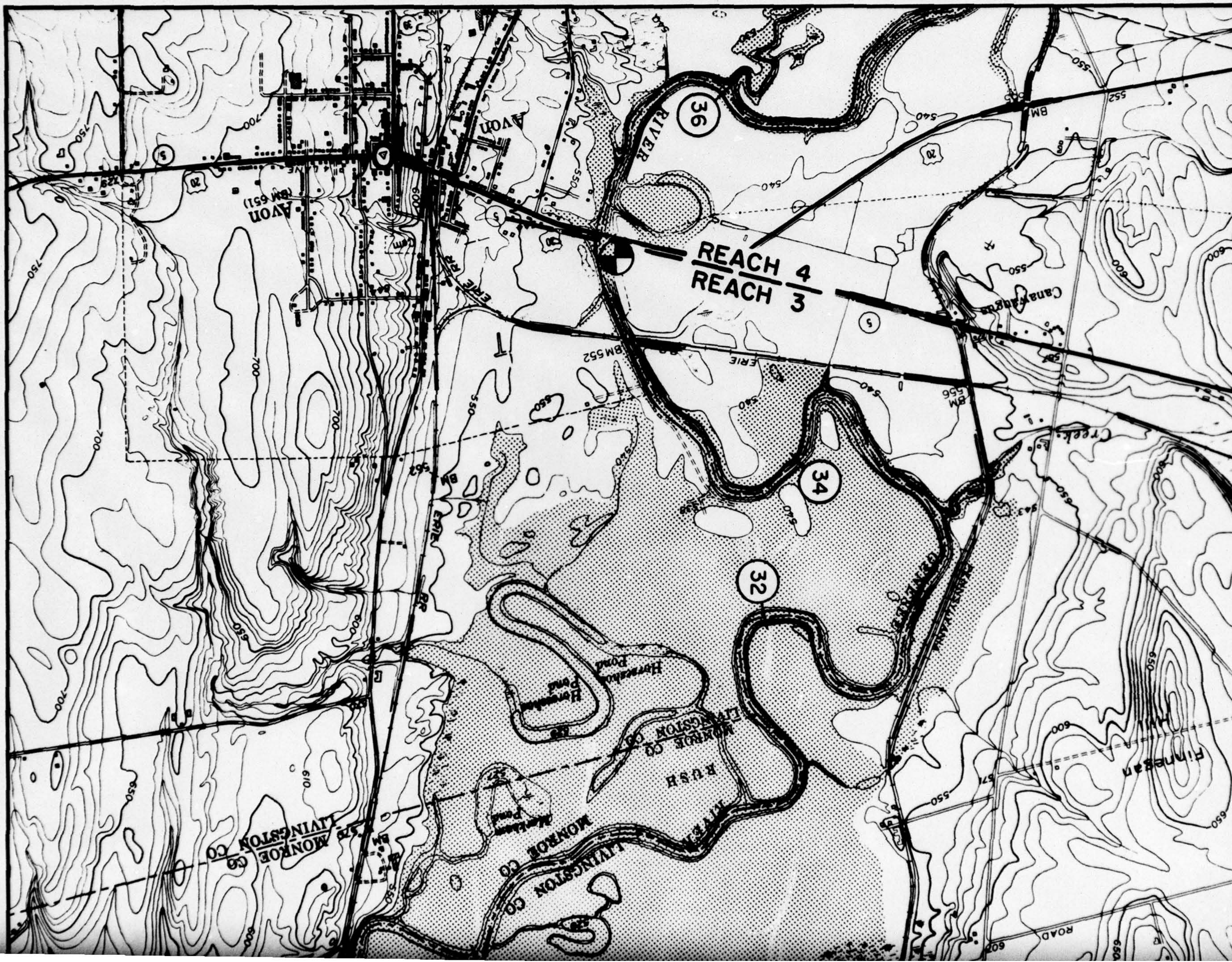

FLOODED AREA
50 YEAR FREQUENCY FLOOD
CHILI
LOWER GENESEE RIVER
MILE 11 TO 20
SHEET 2 OF 13
REACH 1
REACH 2
FLOW
ROCHESTER
BRIGHTON
ROCHESTER AIRPORT
GENESEE
RIVER
RED CREEK
Genesee Valley Park
BALTIMORE AND OHIO
BROOKS AVENUE
BUELL ROAD
SCOTTSVILLE ROAD
ERIE LEHIGH VALLEY
HAWTHORNE
RIVER DRIVE
CANAL
PENNSYLVANIA
BEAHAN ROAD
TRANSMISSION LINE
ELMWOOD
STRONG MEMORIAL HOSPITAL
Crittenden ROAD

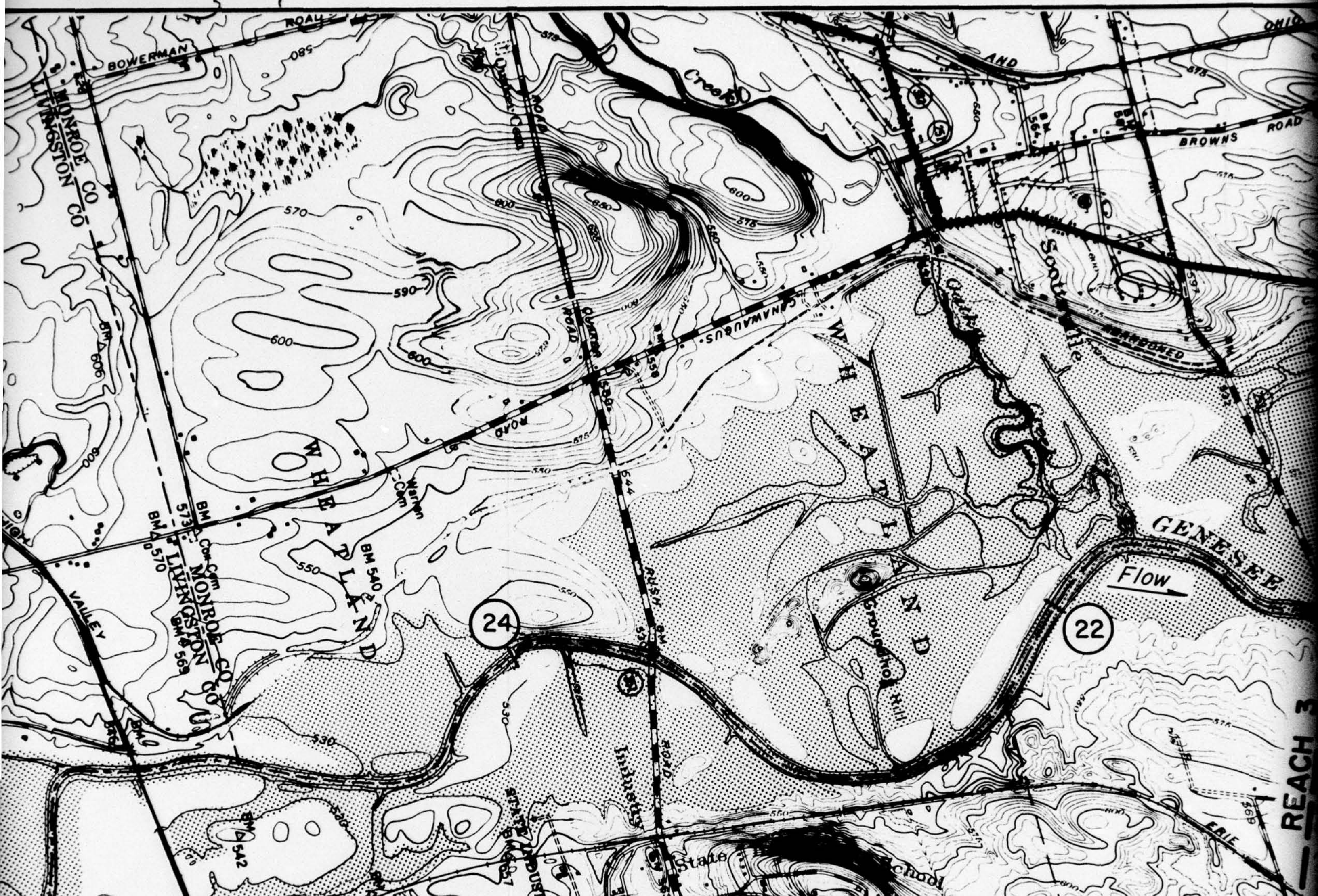
PLATE F4



REACH 4
REACH 3
36
34
32
RIVER

2-1
MONROE CO
LIVINGSTON CO
BOWERMAN
Grant Pond
ROAD
650
700
600
550
610
540
530
LEHIGH VALLEY
PENNSYLVANIA
CALEDONIA
RUSH
RIVER
LIVINGSTON CO
MONROE CO
Creek
30
FLOW
GENESEE
RIVER
28
26
I.P. 3
ERIE RR
Meadow Wood
HONEOYE
1000
0
1000
2000
3000
4000
5000
6000

3 1



BOWERMAN
ROAD
MONROE CO
LIVINGSTON CO
WHEATLAND
Creek
BROWNS ROAD
GENESEE
Flow
24
22
26
REACH 3
Industry
STATE INDUSTRIAL SCHOOL
State
School
ERIE
RIVER
HENRIETTA
RUSH
TELEPHONE
EAST
North Rush
HONEOYE
VALLEY
570
590
600
550
530
650
700
1 MILE
4000
5000
6000
7000 FEET

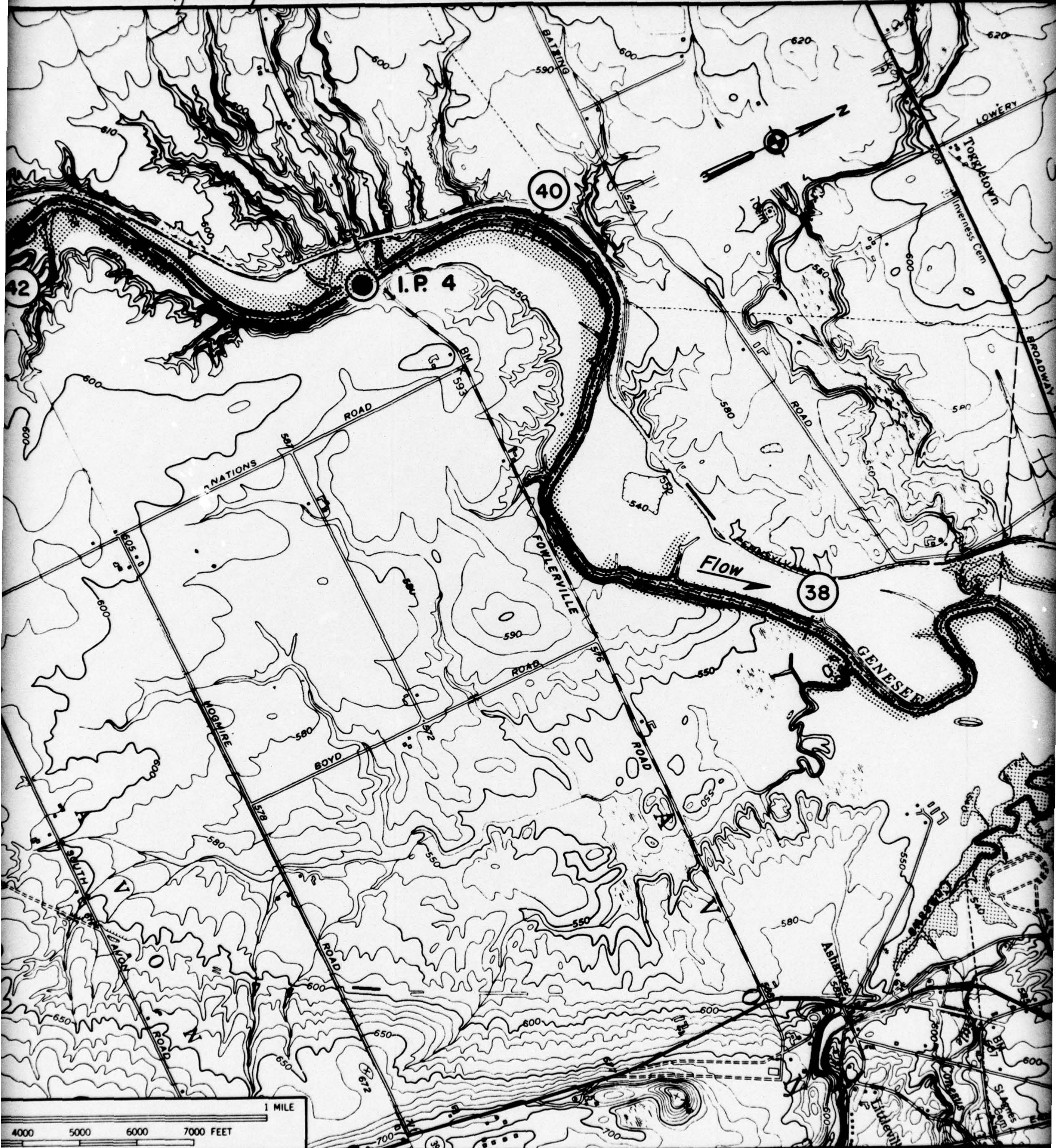
4


GENESEE
Flow
BROWNS BRIDGE
REACH 3
REACH 2
20
22
BROWNS ROAD
REED
CANAL
PENNSYLVANIA
KRENZER
MORGAN ROAD
FARRELL ROAD
ERIE
RIVER
ROAD
HENRIETTA
RUSH
MARTIN
Martin
TELEPHONE
FLOODED AREA
50 YEAR FREQUENCY FLOOD
AVON
LOWER GENESEE RIVER
MILE 19 TO 36
SHEET 3 OF 13

PLATE F 5


54
48
RIVER
GENESEE
50
52
Flow
Hemp Pond
Piffard
ROAD
RIVER

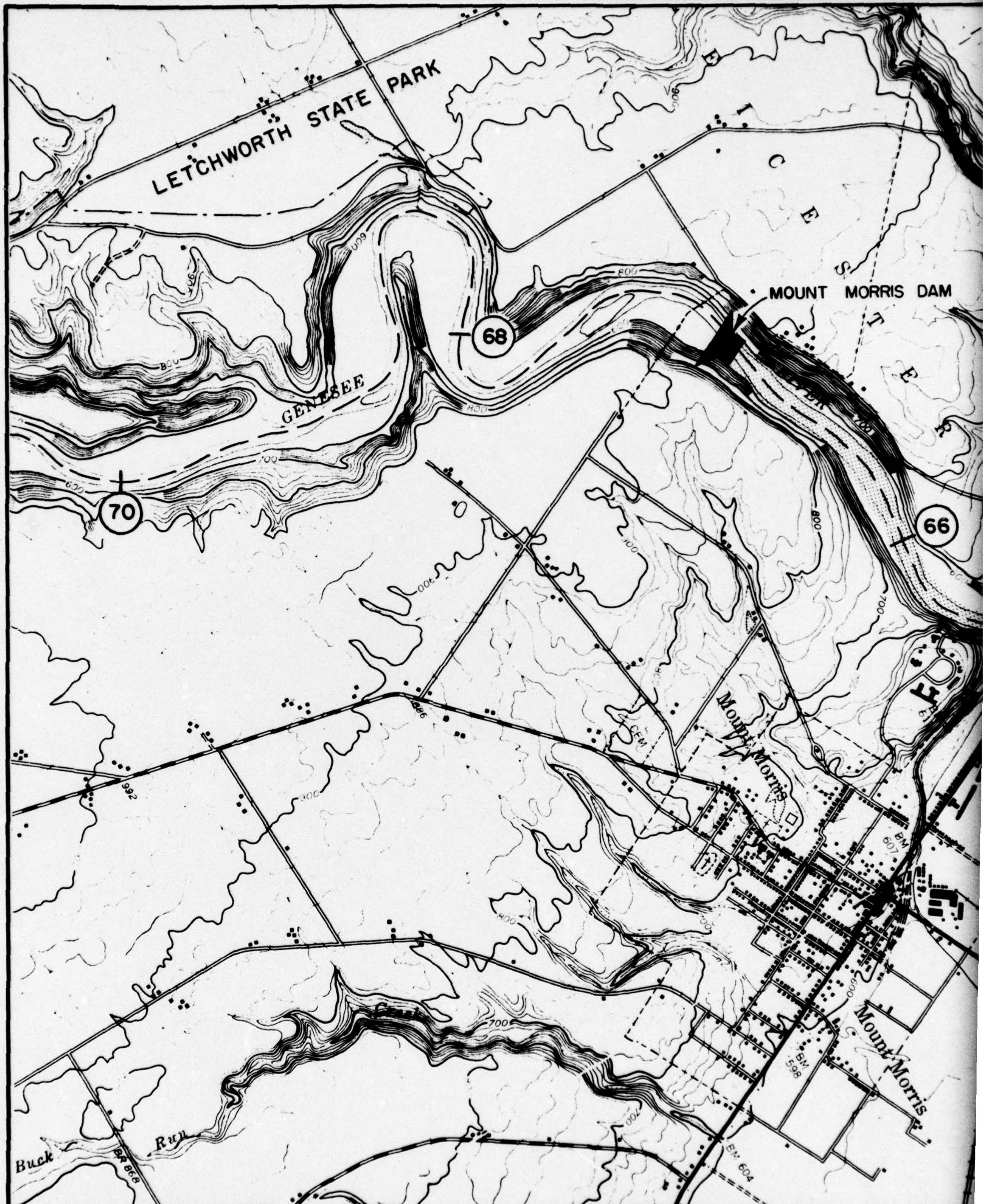
44
42
46
48
Creek
OXBOW
LANE
ROAD
BM
614
NATIONS
HUSTON
ROAD
SMITH
550
600
630
650
680
700
1
½
0
1000
0
1000
2000
3000
4000
5000
6000
7000 FE



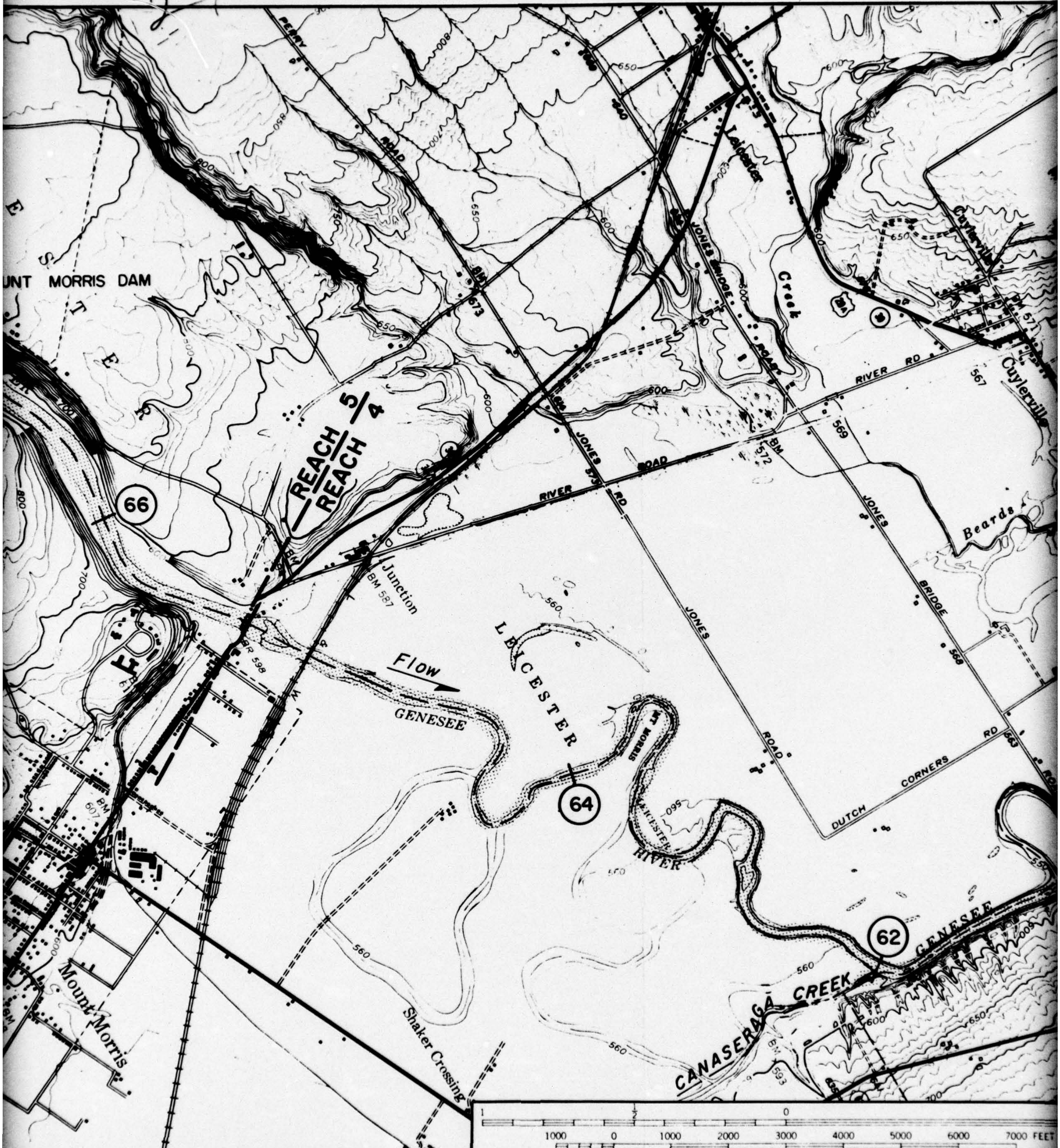
I.P. 4
40
42
38
Flow
GENESEE
BATEING
LOWERY
Tonawanda
Inverness Cem
BROADWAY
NATIONS
ROAD
FOWLERVILLE
ROAD
BOYD
ROAD
MCGUIRE
ROAD
SOUTH
ROAD
Ashantee
Littleville
Conesus
St. Agnes Cem
BM
593
600
610
620
590
580
550
540
650
700
672
1 MILE
4000
5000
6000
7000 FEET

ROAD
LOWERY
Toggletown
Inverness Cem
BROADWAY
ROAD
Creek
Canawaugus
Flow
38
GENESEE
REACH 4
REACH 3
34
36
RIVER
Springs Downs
ERIE
BM552
FLOODED AREA
50 YEAR FREQUENCY FLOOD
GENESEO
LOWER GENESEE RIVER
MILE 34 TO 55
SHEET 4 OF 13

PLATE F 6

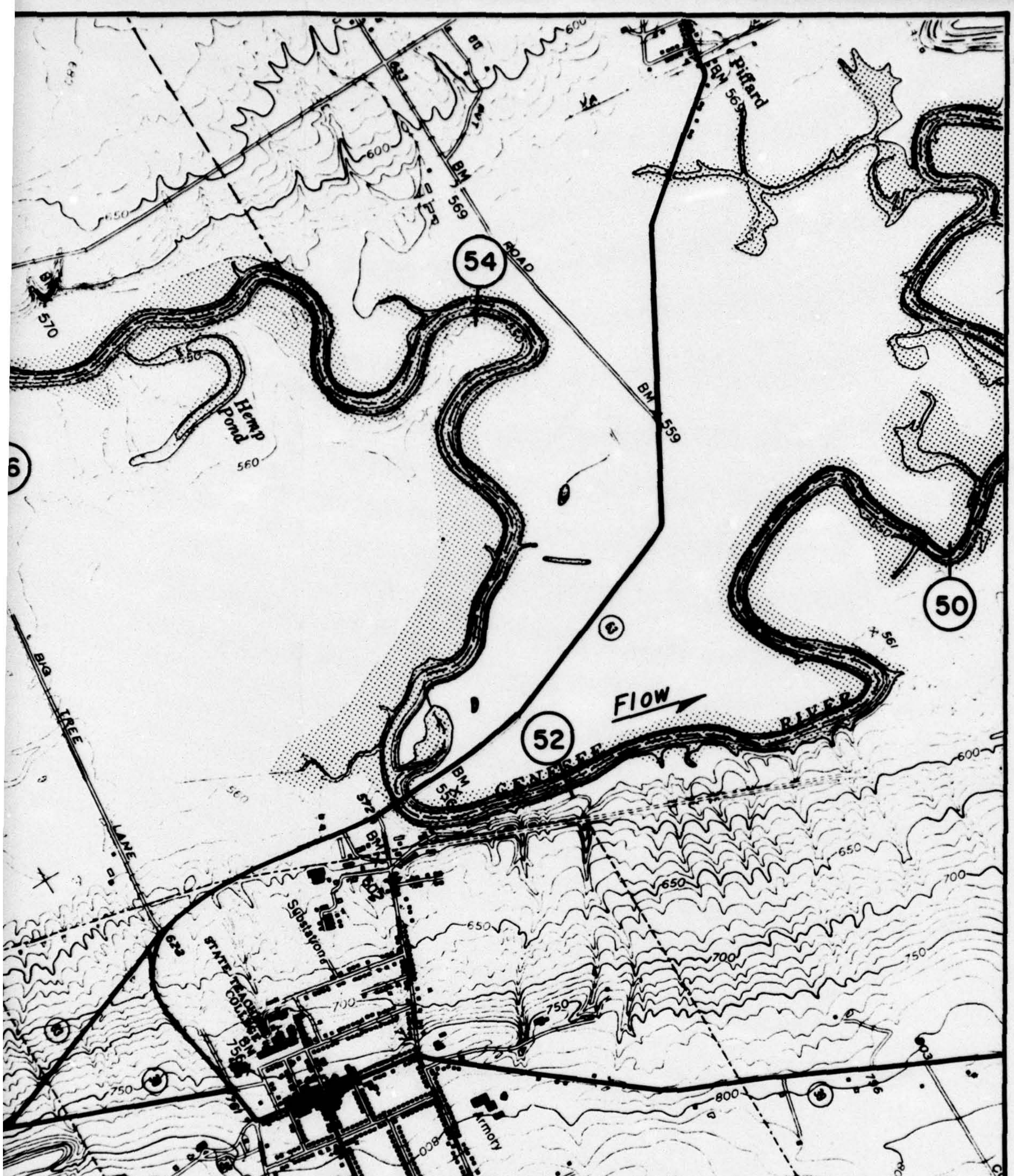


LETCHWORTH STATE PARK
MOUNT MORRIS DAM
GENESEE
68
70
66
Mount Morris
Mount Morris
CEM
Buck
Run
Creek
BM 607
BM 598
BM 604
BM 868
992
986
800
700
600
900


MOUNT MORRIS DAM
REACH 5
REACH 4
66
64
62
Flow
GENESEE
LEICESTER
Junction
BM 587
MT MORRIS
LEICESTER
RIVER
Creek
Leicester
JONES BRIDGE ROAD
JONES ROAD
JONES BRIDGE
RIVER ROAD
RIVER RD
DUTCH CORNERS RD
Cuylerville
Beards
PERRY ROAD
CANASERAGA CREEK
GENESEE
Shaker Crossing
Mount Morris
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

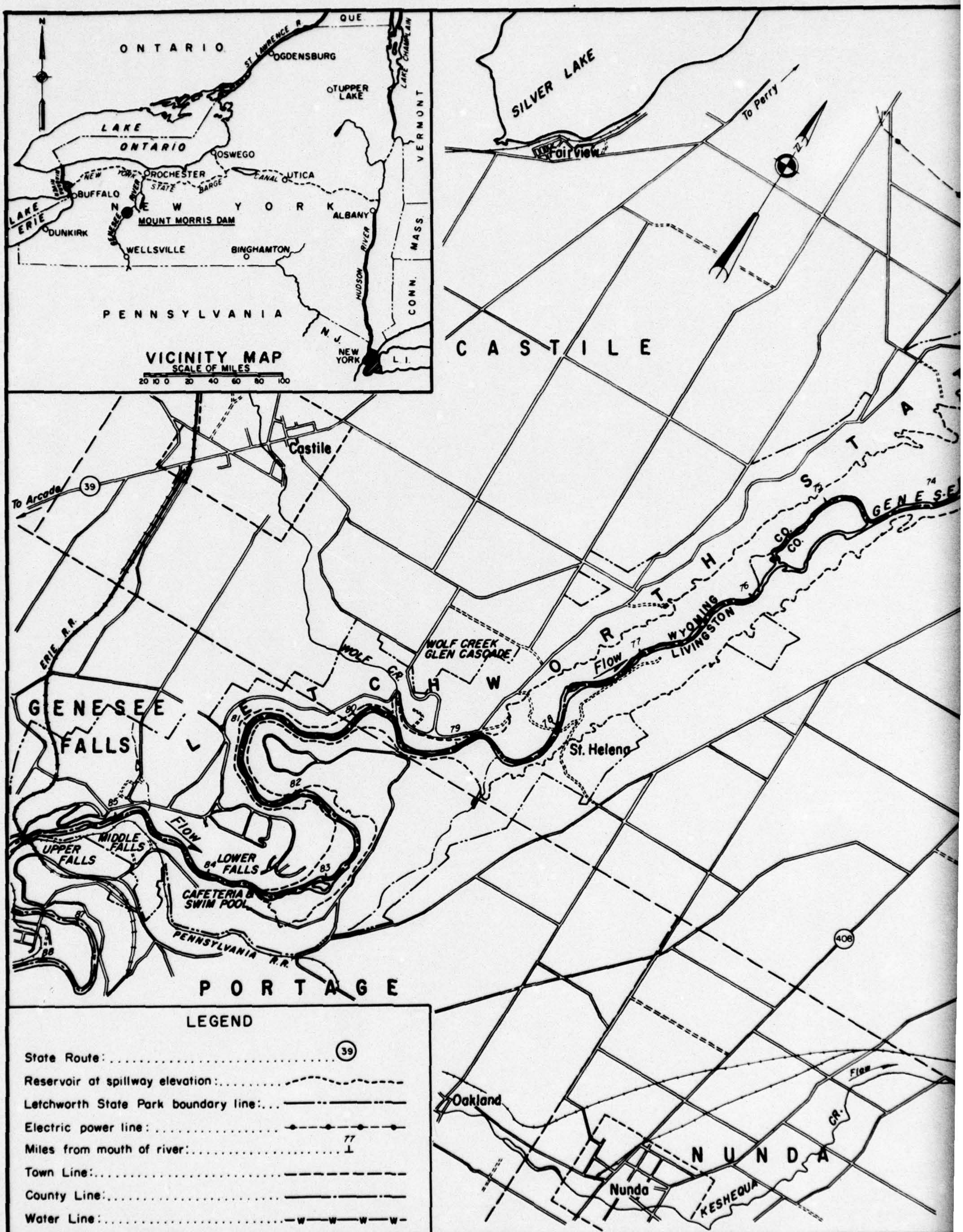
N
RIVER ROAD
Cuylerville
RIVER RD
L E I C E S T E R
Beards Creek
BOYD-PARKER STATE PARK
JONES BRIDGE
BARRETT RD
DUTCH CORNERS RD
ROAD
BIG TREE LANE
Hemp Pond
56
58
60
62
GENESEE RIVER
Dewey Hill
Fall Brook Falls
St Marys Cemetery
1 MILE
4000 5000 6000 7000 FEET

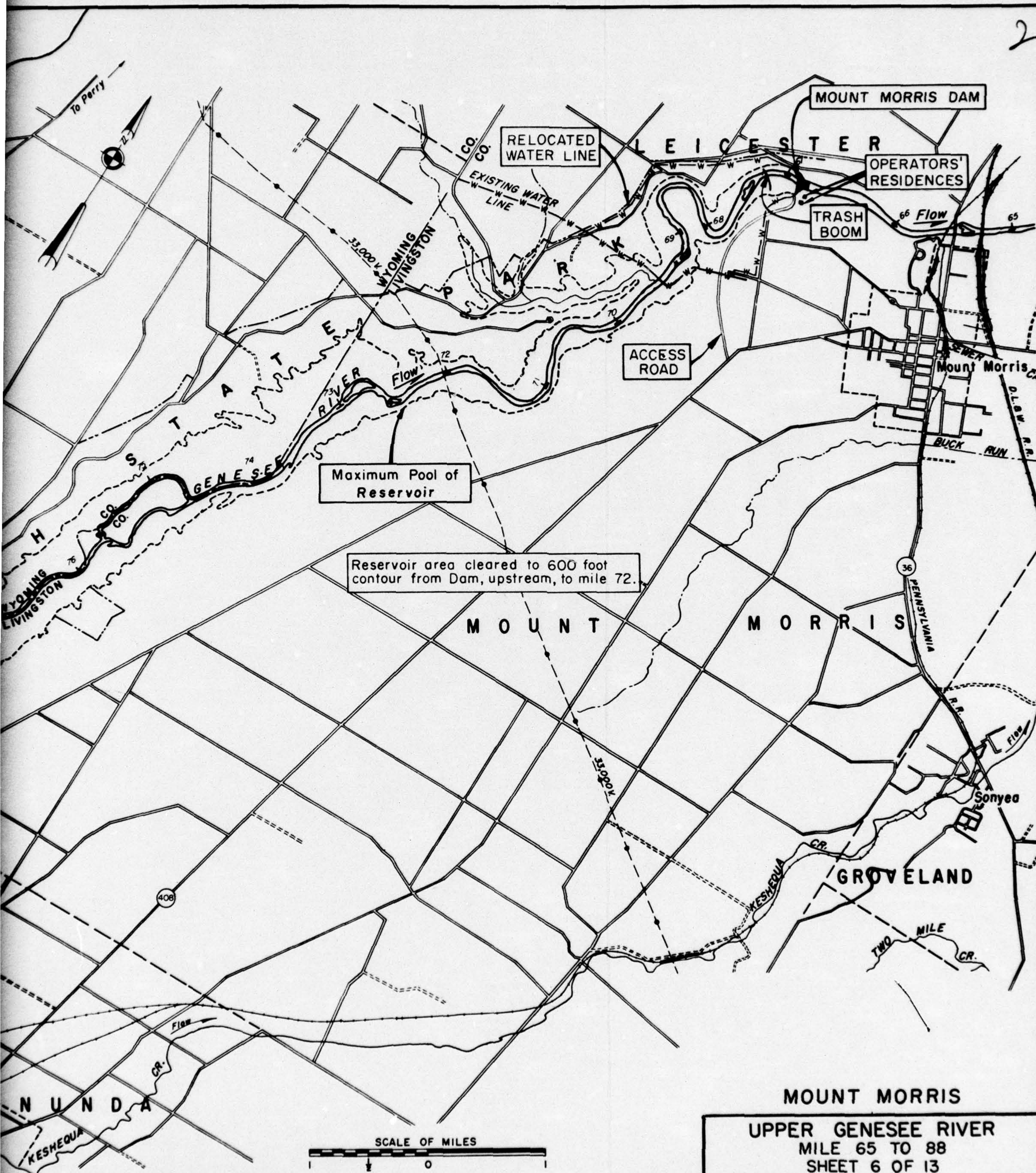
4



Piffard
BM 569
ROAD
54
Hemp Pond
560
BM 559
50
52
Flow
GENESEE RIVER
BIG TREE LANE
600
650
700
750
800
850
900
STATE TEACHERS COLL
Armory
GENESEO
Temple Hill Cemetery
St. Mary's Cemetery
FLOODED AREA
50 YEAR FREQUENCY FLOOD
GENESEO
LOWER GENESEE RIVER
MILE 50 TO 70
SHEET 5 OF 13

PLATE F 7

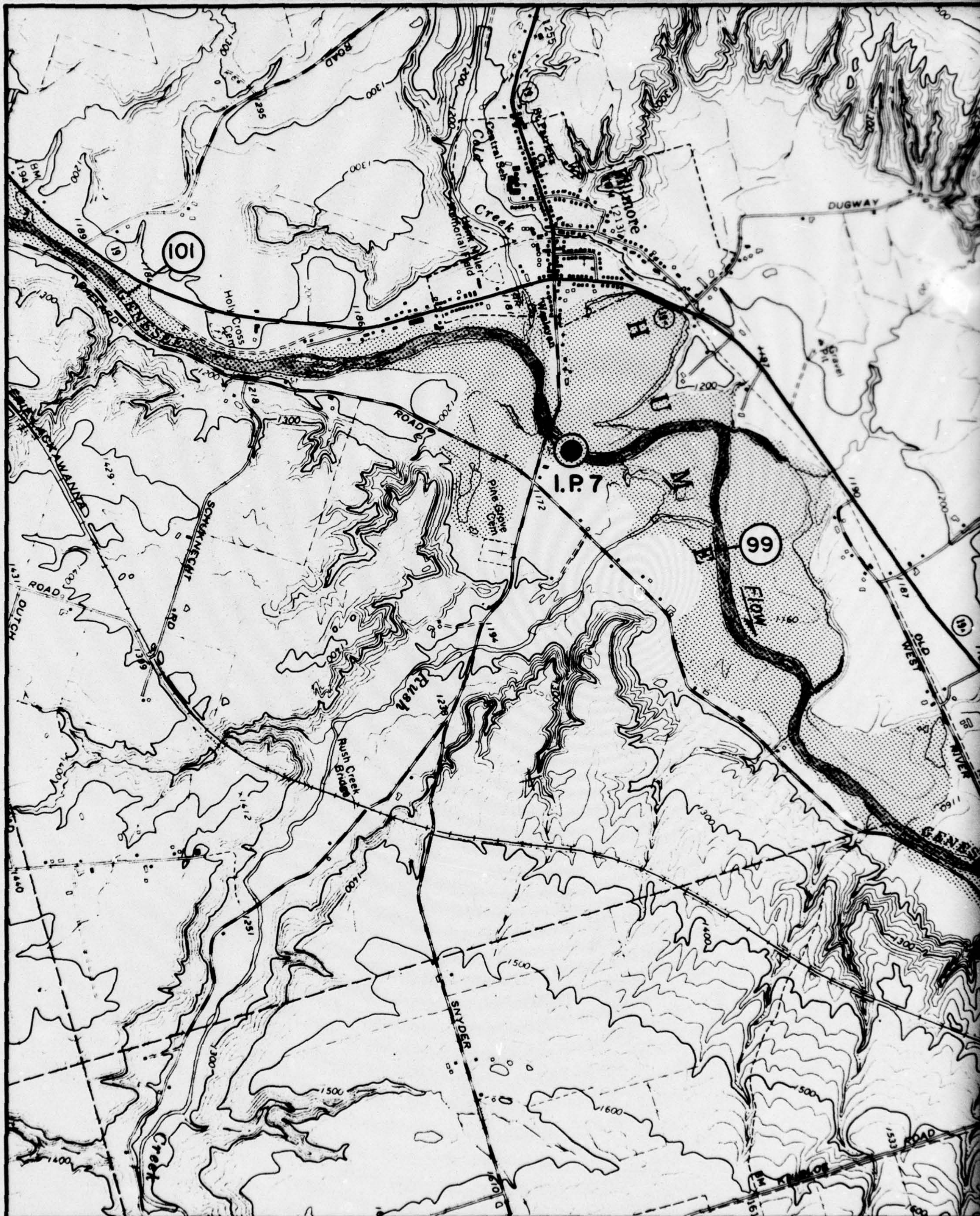

VICINITY MAP
SCALE OF MILES
20 10 0 20 40 60 80 100
ONTARIO
QUE
ST LAWRENCE R.
OGDENSBURG
TUPPER LAKE
LAKE CHAMPLAIN
VERMONT
LAKE ONTARIO
OSWEGO
ROCHESTER
NEW YORK STATE BARGE CANAL
UTICA
BUFFALO
LAKE ERIE
NEW YORK
ALBANY
MOUNT MORRIS DAM
DUNKIRK
GENESEE RIVER
MASS.
WELLSVILLE
BINGHAMTON
HUDSON RIVER
CONN.
PENNSYLVANIA
N.J.
NEW YORK
L.I.
SILVER LAKE
To Perry
Fairview
CASTILE
Castile
To Arcade
39
ERIE R.R.
LETCHWORTH STATE
WOLF CR.
WOLF CREEK GLEN CASCADE
Flow
WYOMING CO.
LIVINGSTON CO.
GENESEE
74
75
76
77
78
79
80
81
82
83
84
85
88
GENESEE FALLS
St. Helena
UPPER FALLS
MIDDLE FALLS
LOWER FALLS
CAFETERIA & SWIM POOL
PENNSYLVANIA R.R.
PORTAGE
408
Oakland
NUNDA
Nunda
KESHEQUA CR.
LEGEND
State Route: 39
Reservoir at spillway elevation:
Letchworth State Park boundary line:
Electric power line:
Miles from mouth of river: 77
Town Line:
County Line:
Water Line: w w w w



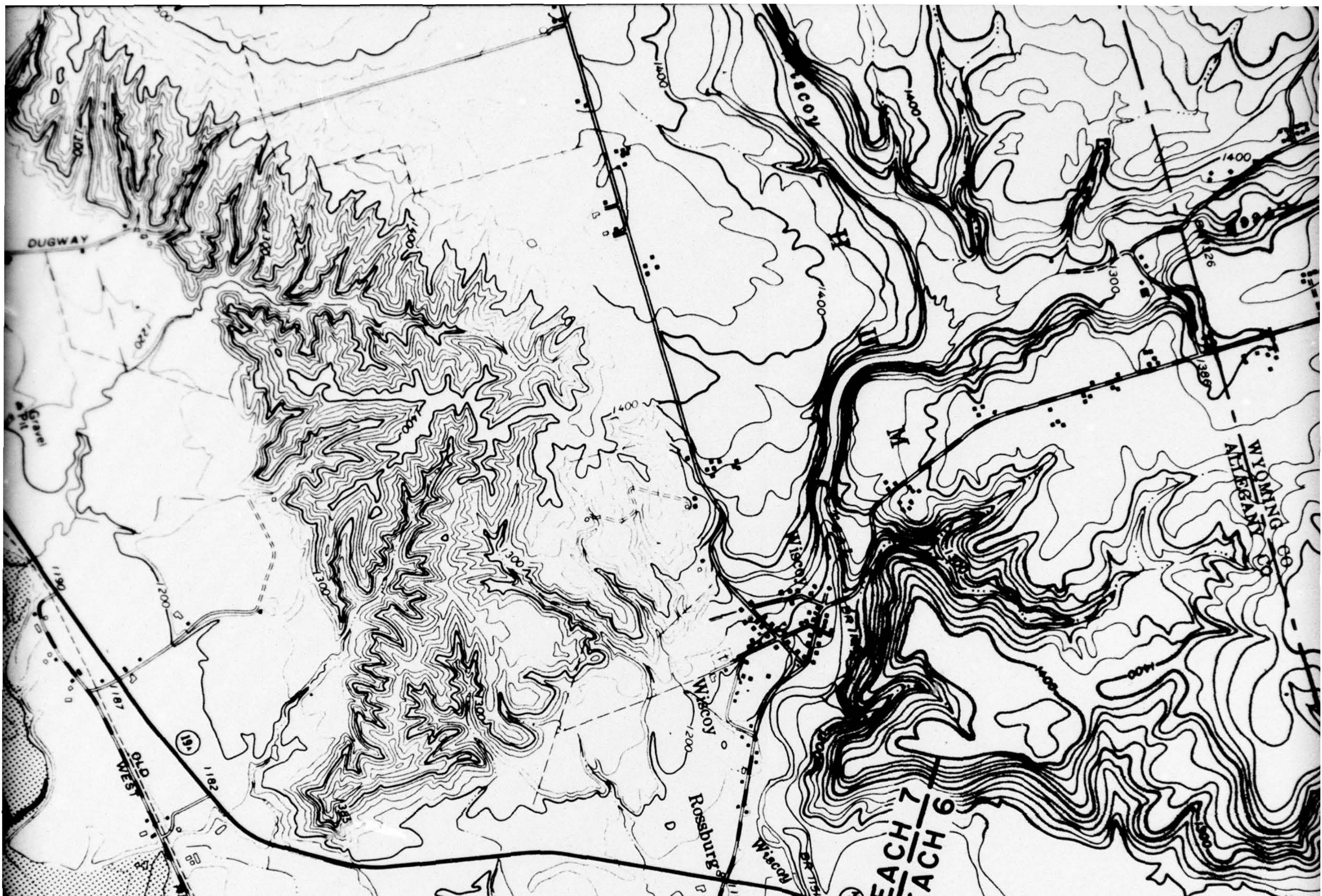
MOUNT MORRIS

UPPER GENESEE RIVER
MILE 65 TO 88
SHEET 6 OF 13

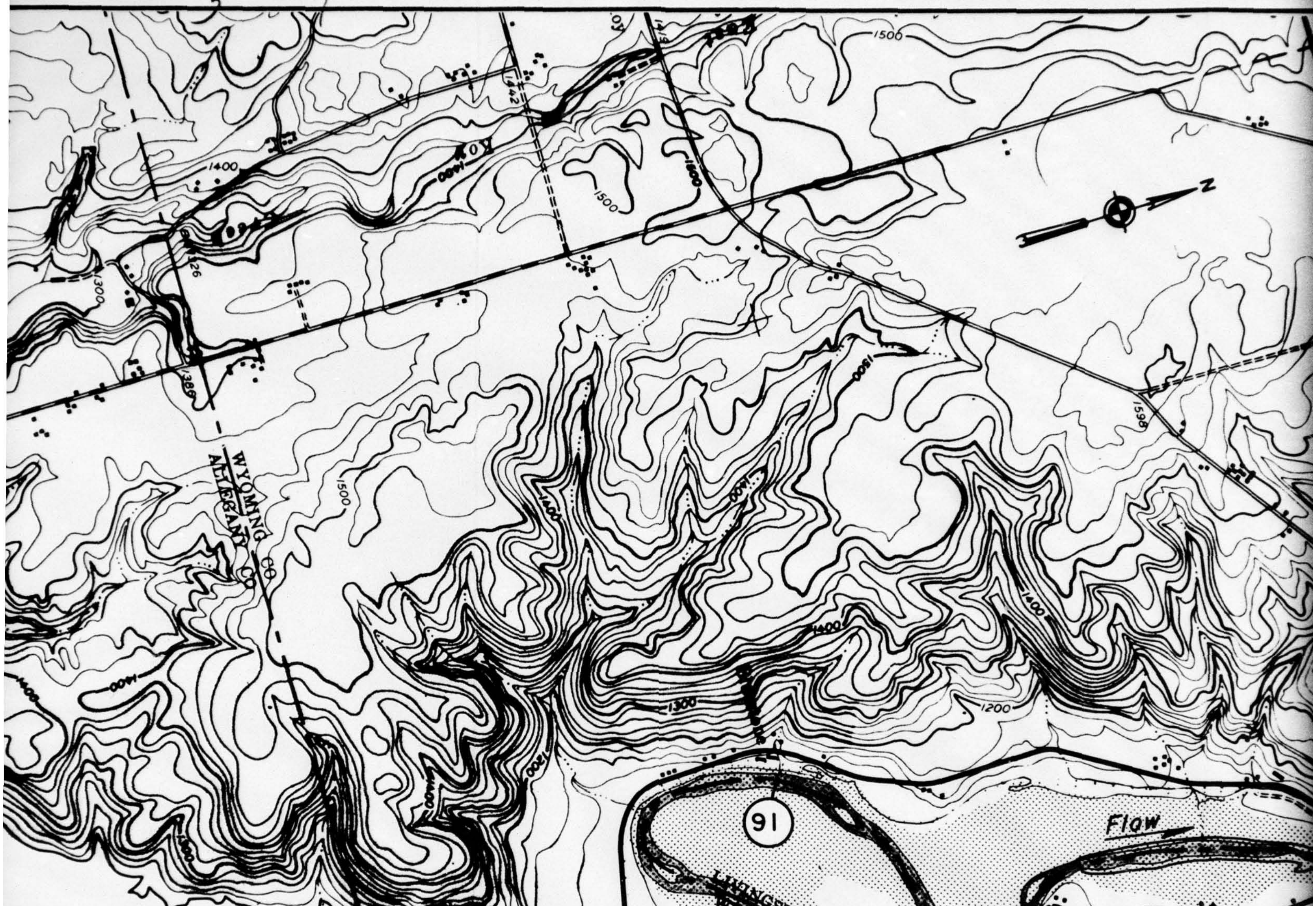
PLATE F 8



I.P.7
99
101
Fillmore
GENESEE
H
U
M
E
Flow
Creek
Rush
DUGWAY
Central Sch
Holy Cross Cem
Pine Grove Cem
Rush Creek Bridge
Gravel Pit
ROAD
DUTCH
SNYDER
OLD
WEST
RIVER


DUGWAY
Gravel Pit
OLD WEST RIVER RAIL-ROAD
ROAD GRADE
GENESEE
RIVER
97
95
PIPELINE
Rossburg
Wiscoy
REACH 7
REACH 6
WYOMING CO.
ALLEGANY CO.
ROAD
1 ½ 0
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

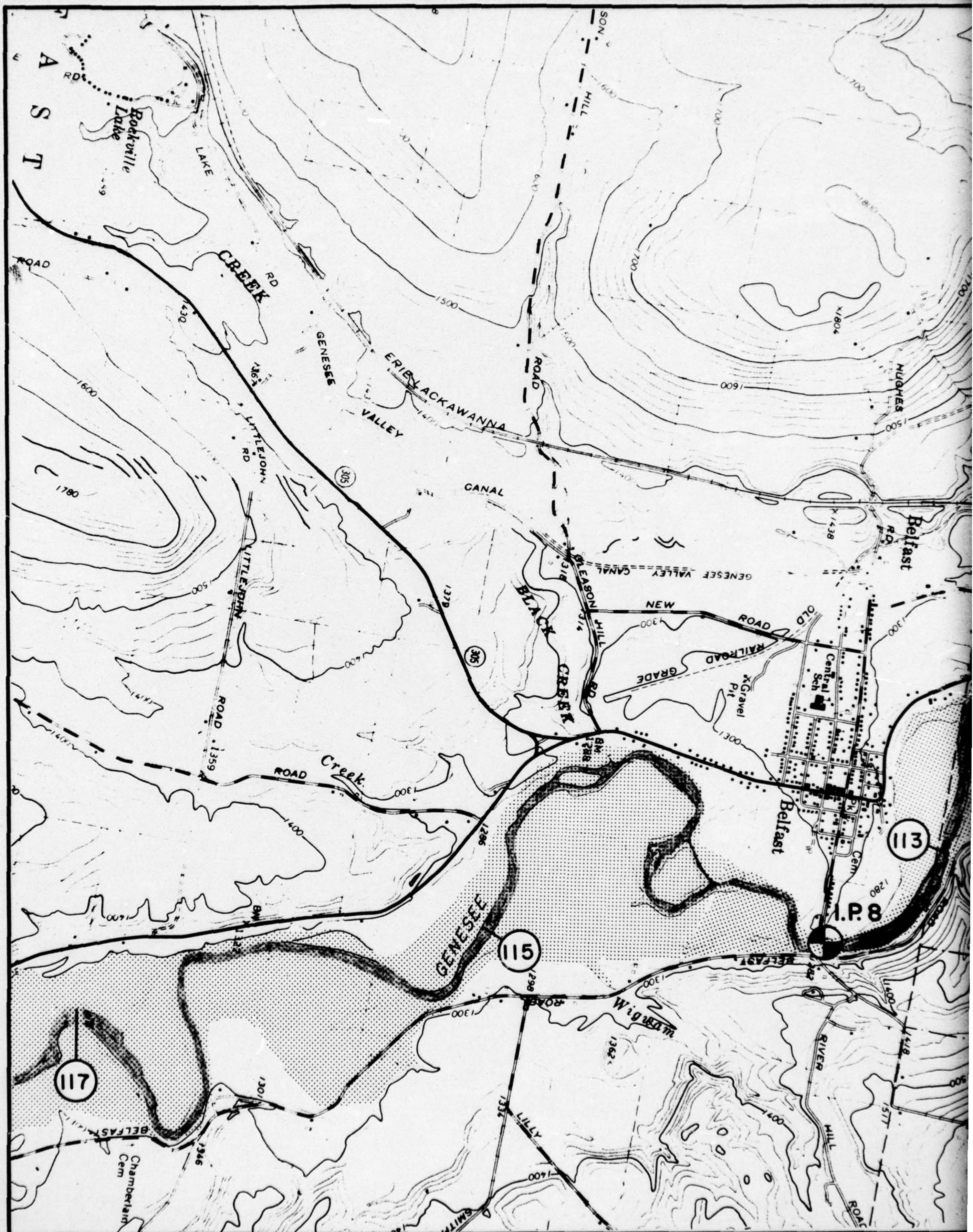
3



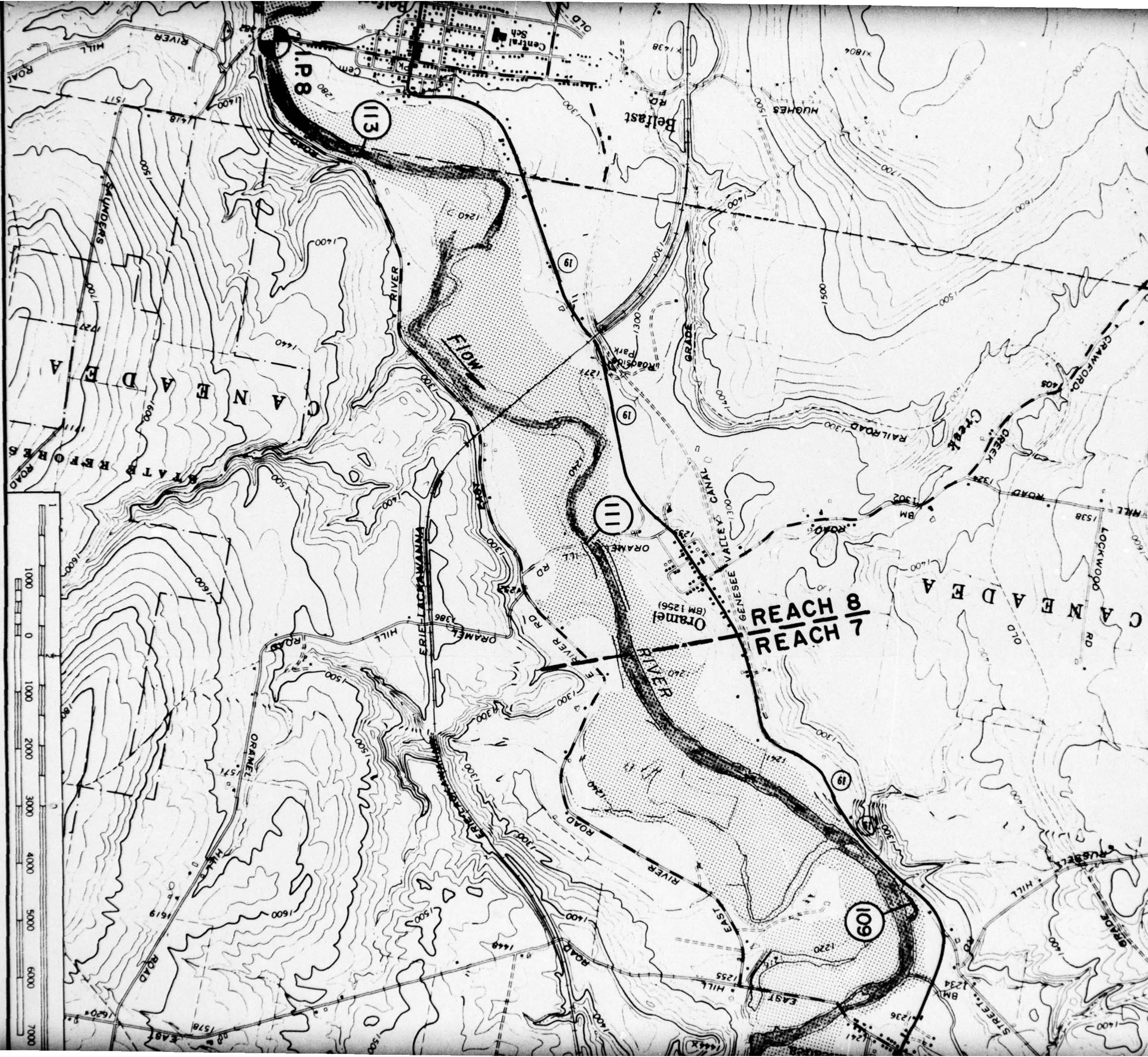
WYOMING CO
ALLEGANY CO
LIVINGSTON CO
WYOMING CO
91
93
95
Flow
Flow
RIVER
GENESEE
N
1500
1400
1200
1300

GENESEE FALLS
REACH 6
I.P.6
Flow
87
89
Portageville
Portage
FLOODED AREA
1950 FLOOD
PORTAGEVILLE
FILLMORE
UPPER GENESEE RIVER
MILE 86 TO 101
SHEET 7 OF 13

PLATE F 9

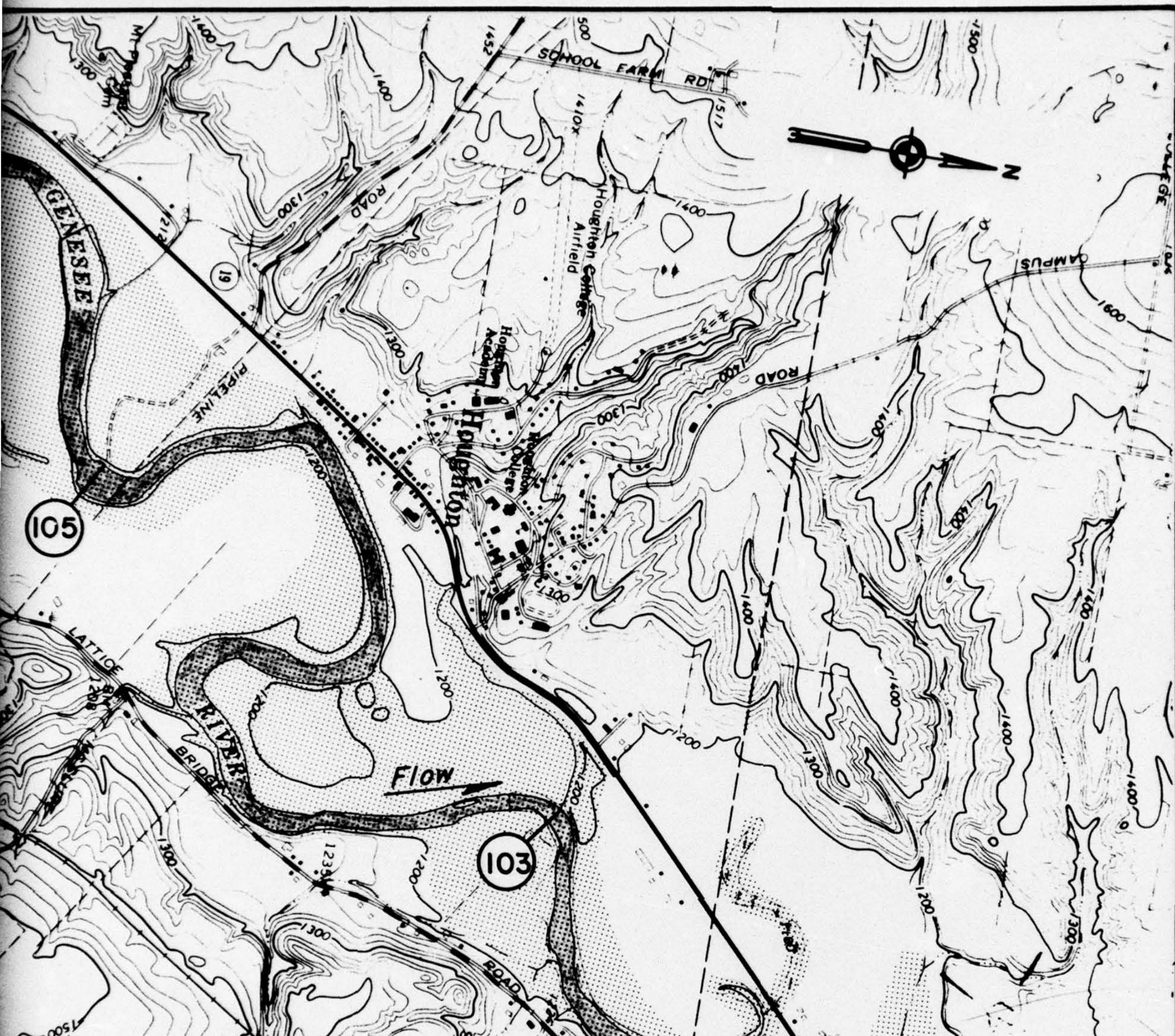


Rockville Lake
LAKE RD
CREEK
GENESEE VALLEY CANAL
ERIE LACKAWANNA
LITTLEJOHN RD
LITTLEJOHN ROAD
ROAD
Creek
BLACK CREEK
GLEASON HILL RD
NEW ROAD
OLD RAILROAD GRADE
Central Sch
Gravel Pit
Belfast
Belfast
Cem
HUGHES RD
HILL ROAD
GENESEE
Wigwam
ROAD
BELFAST
RIVER HILL ROAD
LILLY
Chamberlain Cem
113
115
117
I.P. 8
1780
1600
1500
1400
1300


REACH 8
REACH 7
CANEADEA
CANEADEA
Oramel (BM 1256)
RIVER
Flow
Creek
CRAWFORD CREEK ROAD
LOCKWOOD RD
RAILROAD GRADE
GENESEE VALLEY CANAL
ERIE-LACKAWANNA
Belfast
Central Sch
I.P. 8
109
111
113
19
ORAMEL HILL RD
RIVER RD
EAST RIVER ROAD
ORAMEL HILL ROAD
SAUNDERS
STATE REFOREST ROAD
RUSSELL HILL RD
RIVER HILL ROAD
HUGHES
1000 0 1000 2000 3000 4000 5000 6000 7000

3

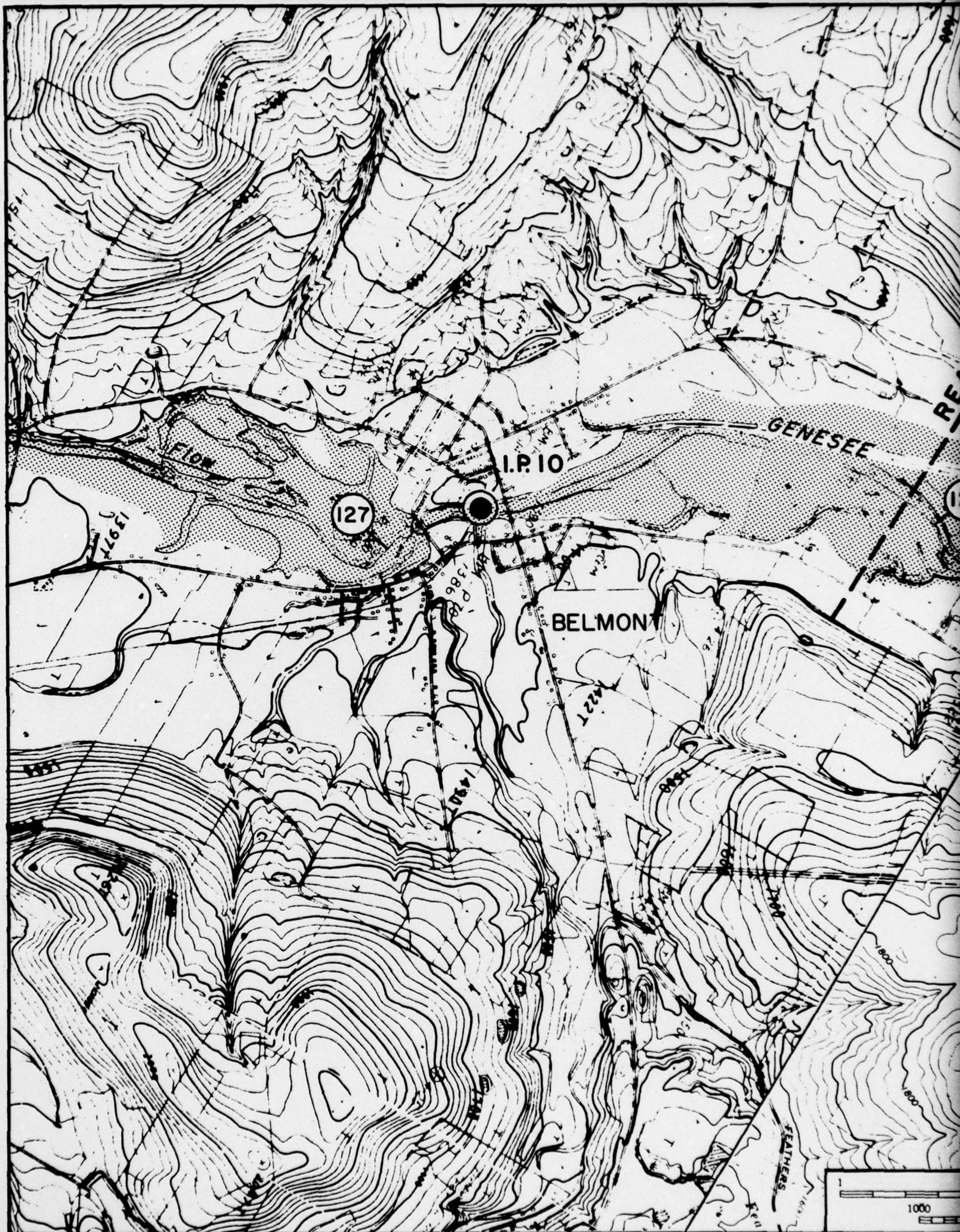
Caneadea
GENESEE
RIVER
Houghton
Flow
109
107
105
103
Shongo
Creek
ERIE-LACKAWANNA
LATTICE
BRIDGE
ROAD
FOX HILL RD
PINKERTON
ROAD
EAST HILL
PIPELINE
STREET
MILL
Gaging Sta
1 MILE
5000 6000 7000 FEET



FLOODED AREA
1950 FLOOD
FILLMORE
BELFAST

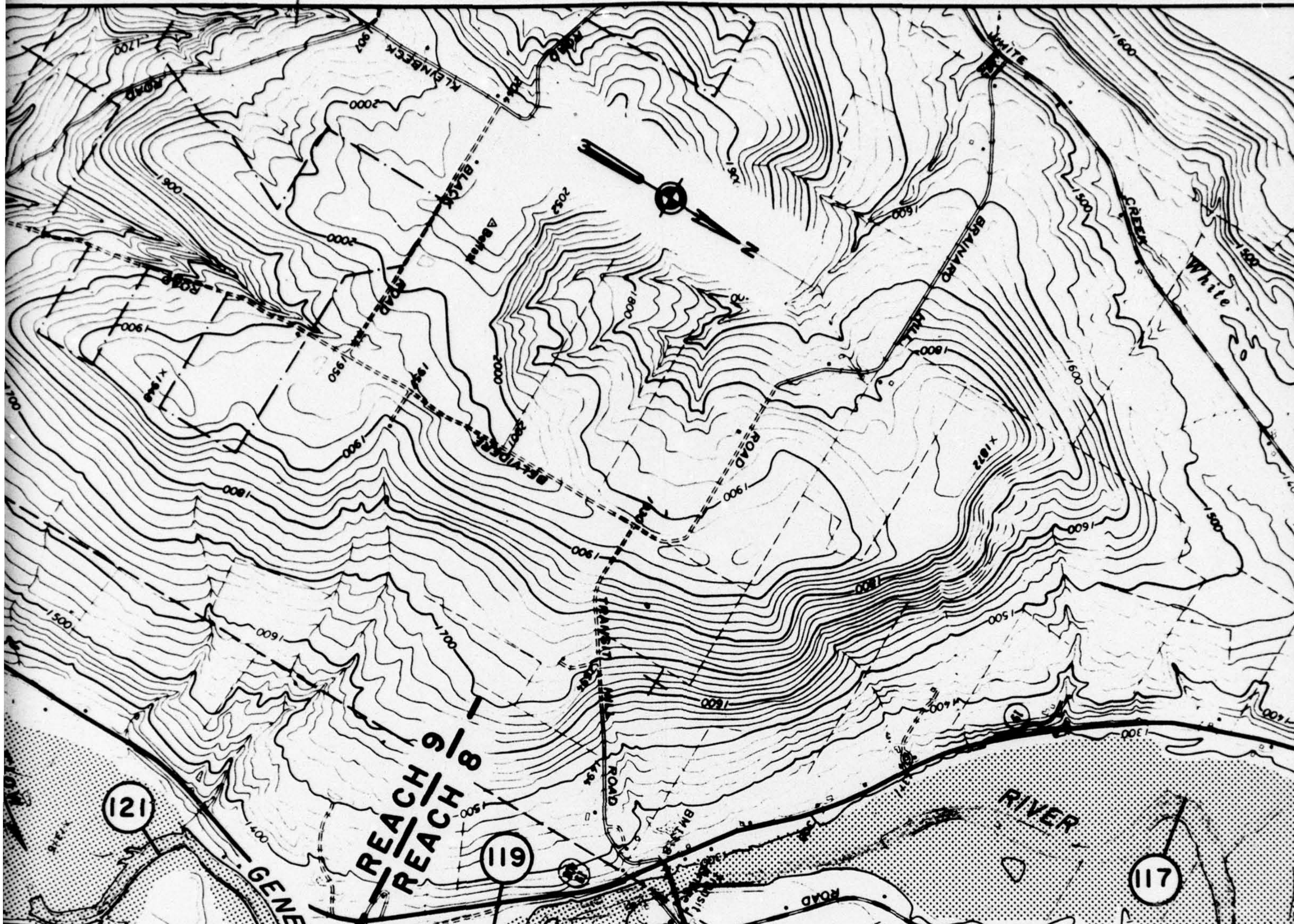
UPPER GENESEE RIVER
MILE 101 TO 117
SHEET 8 OF 13

PLATE F 10



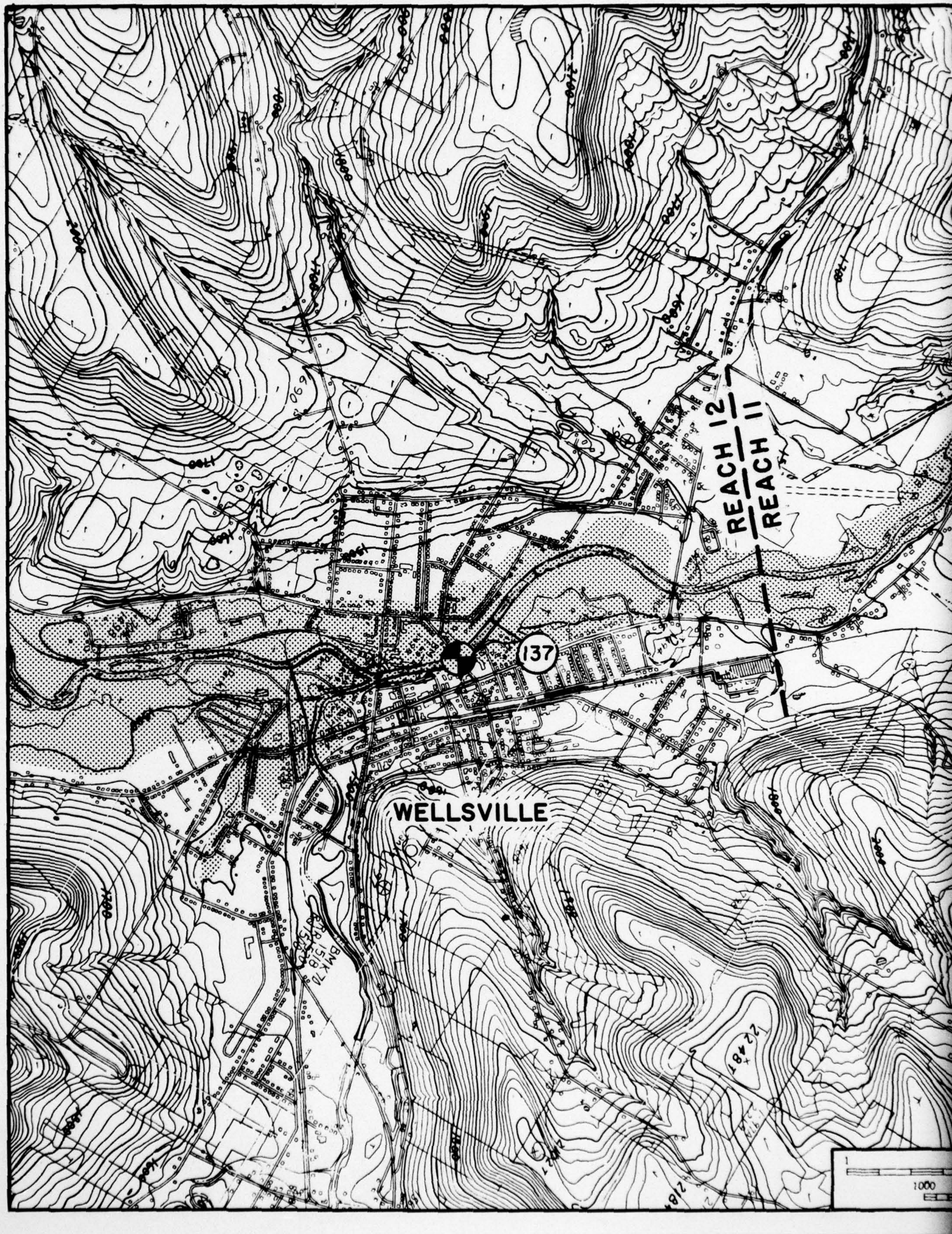
GENESEE
FLOW
I.P. 10
127
BELMONT
1397
1386
1422
1490
FEATHERS
1000

REACH 10
REACH 9
GENESEE
RIVER
FLOW
125
123
121
I.P. 9
Gravel Pit
Belvidere
Canaseraga Creek
ERIE-LACKAWANNA
GIBSON HILL ROAD
OLD STATE ROAD
GRADE
CAMP ROAD
RIVER ROAD
PIPELINE
WARNER RD
GIBSON
FEATHERS
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET



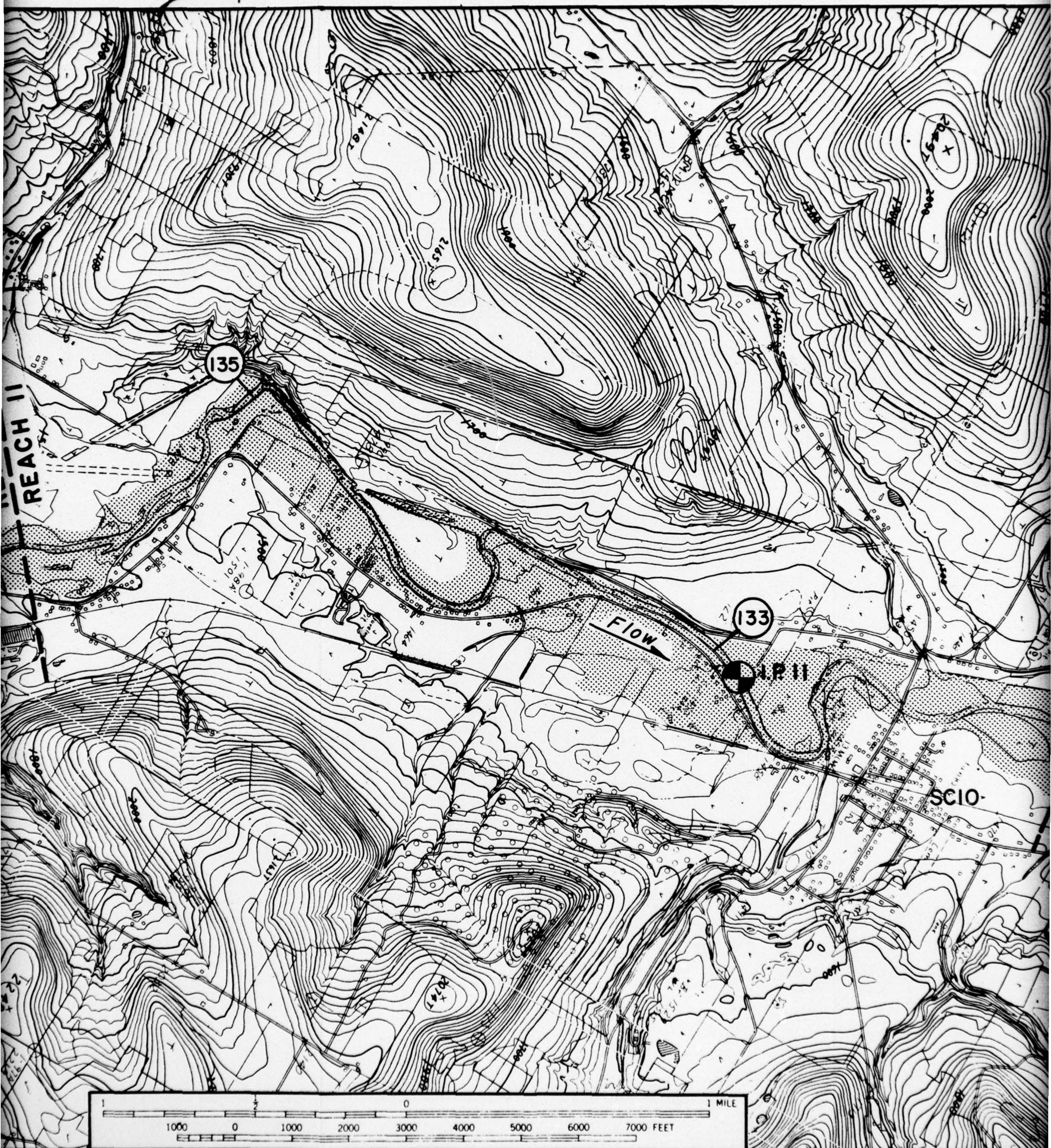
UPPER GENESEE RIVER
MILE 117 TO 128
SHEET 9 OF 13

PLATE F 11



REACH 12
REACH 11
137
WELLSVILLE
1000

7-1


REACH II
135
133
Flow
I.P. 11
SCIO
1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

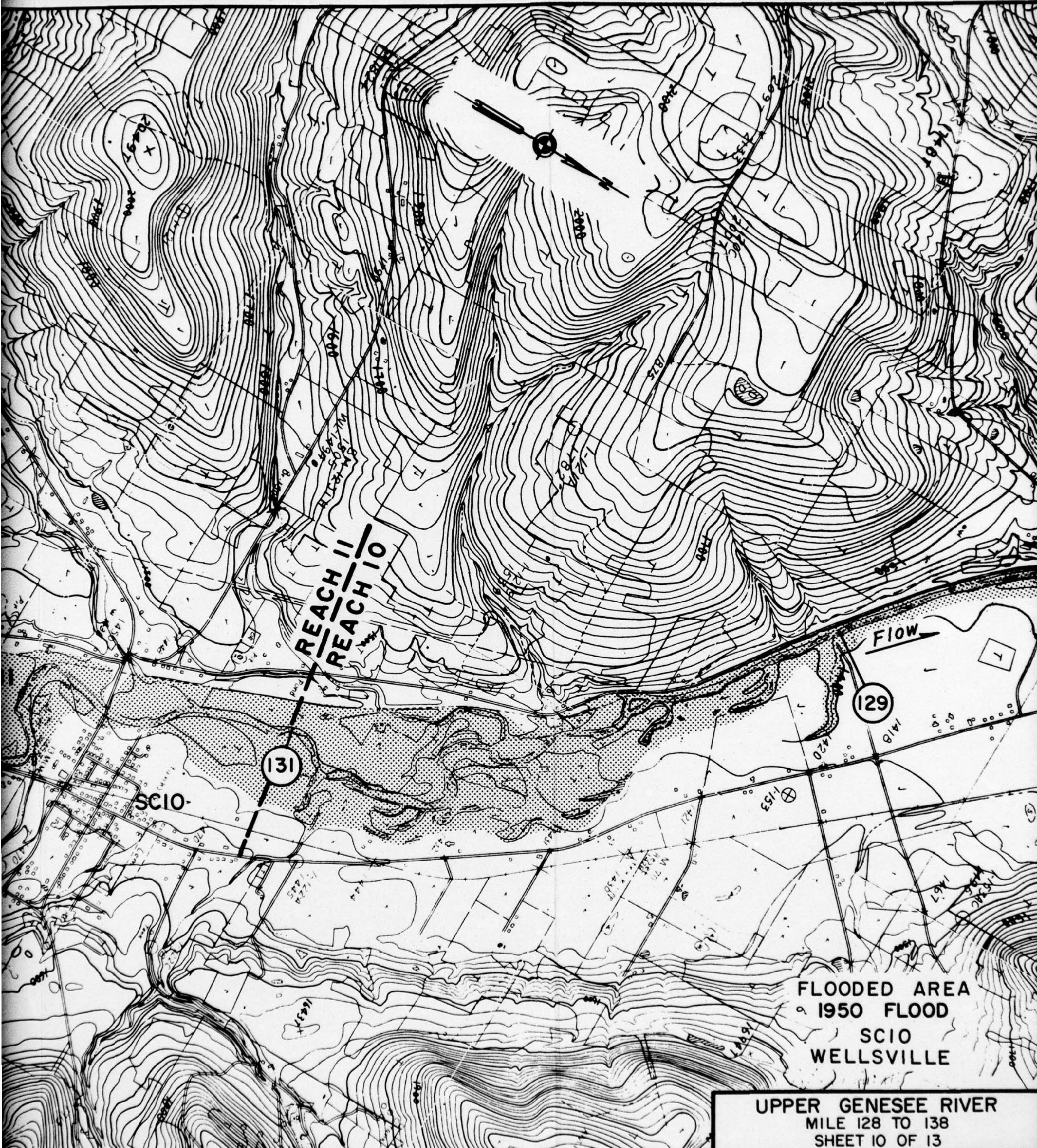
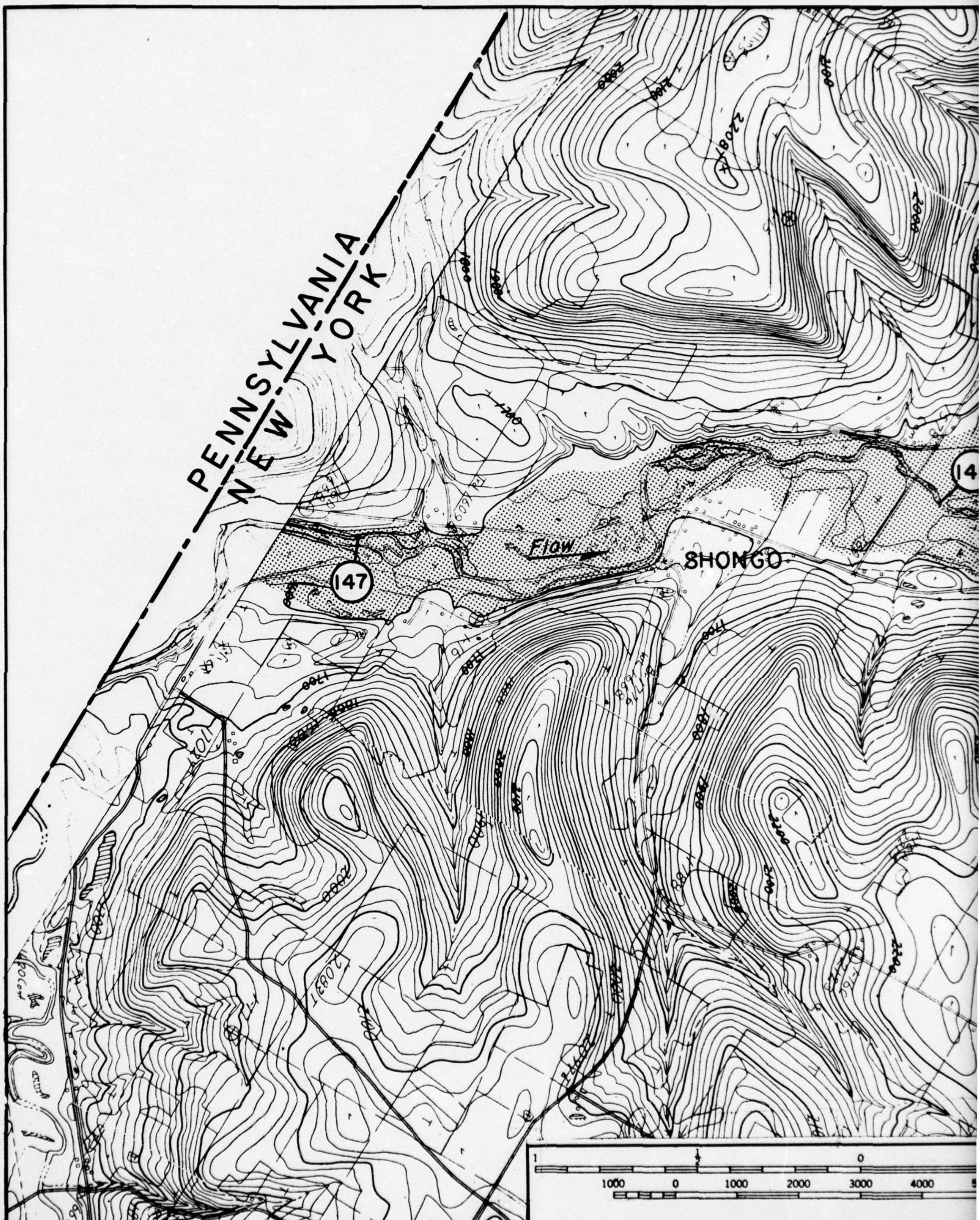
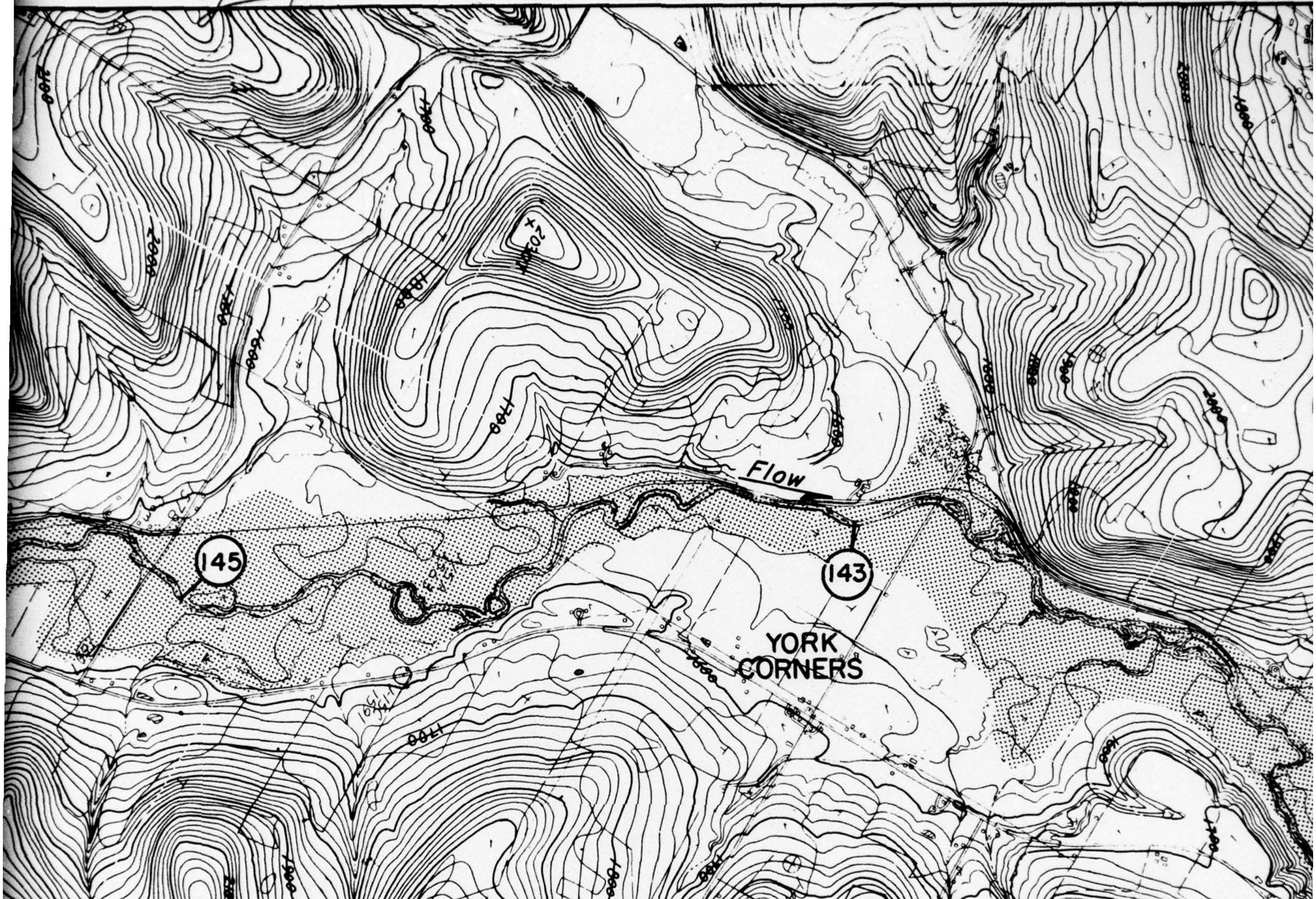

REACH 11
REACH 10
FLOW
131
129
SCIO
FLOODED AREA
1950 FLOOD
SCIO
WELLSVILLE
UPPER GENESEE RIVER
MILE 128 TO 138
SHEET 10 OF 13

PLATE F 12


PENNSYLVANIA
NEW YORK
Flow
SHONGO
147
1000
0
1000
2000
3000
4000

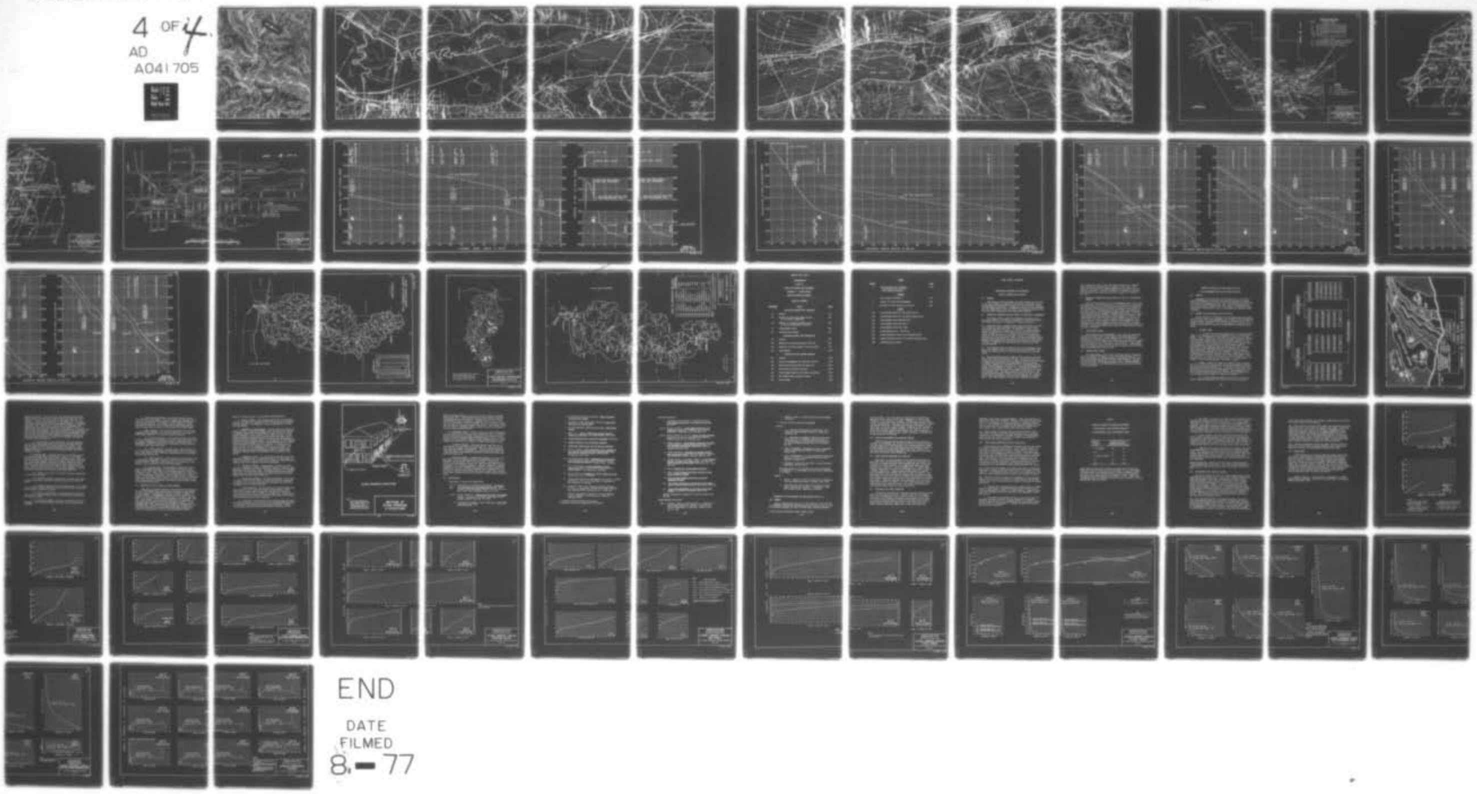


Flow
145
143
YORK
CORNERS
0
1 MILE
2000
3000
4000
5000
6000
7000 FEET

AD-A041 705 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 8/6
GENESEE RIVER BASIN COMPREHENSIVE STUDY OF WATER AND RELATED LA--ETC(U)
1967

UNCLASSIFIED NL

4 OF 4
AD
A041705



END
DATE
FILMED
8-77

4 OF 4

D

041705

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

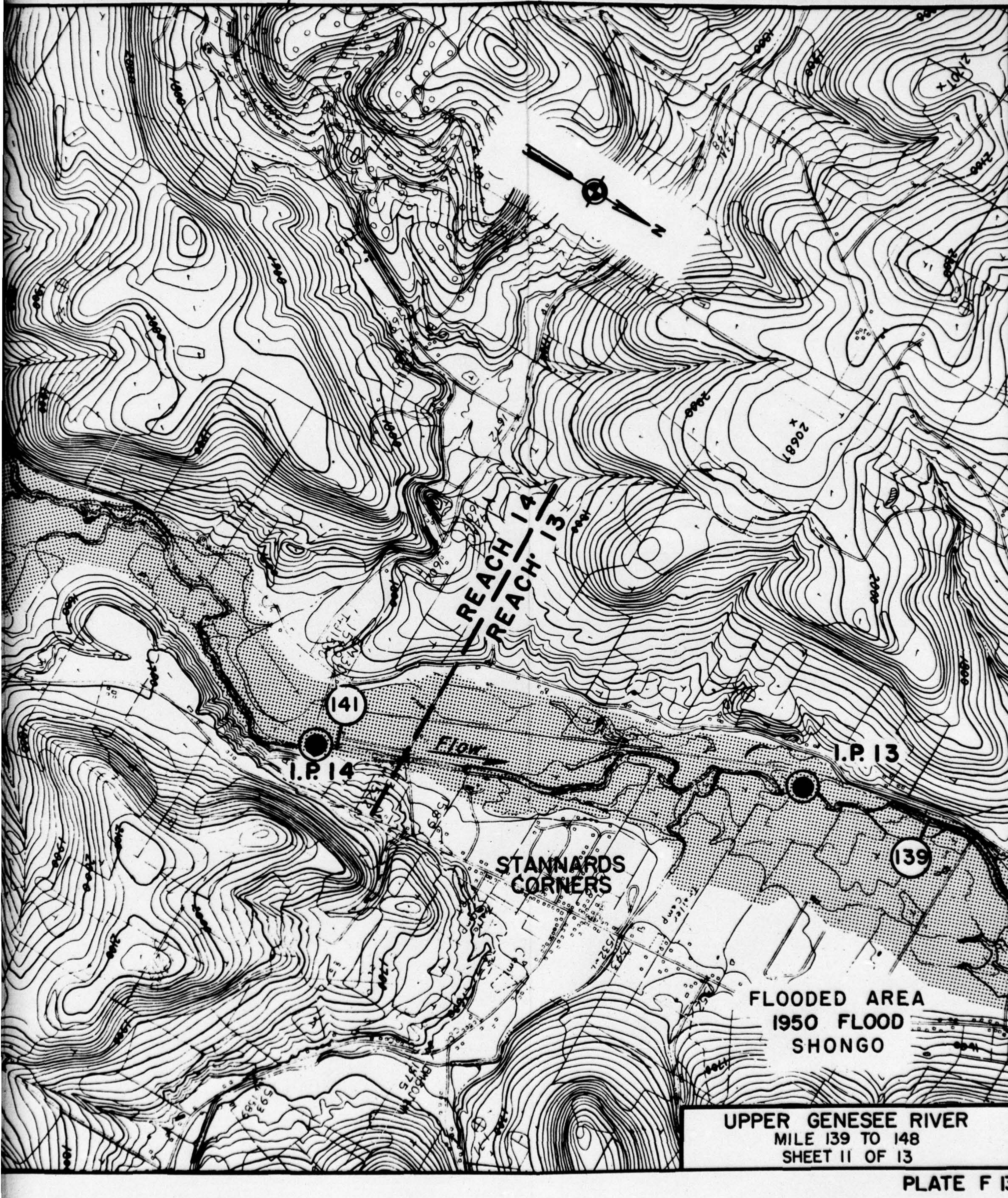
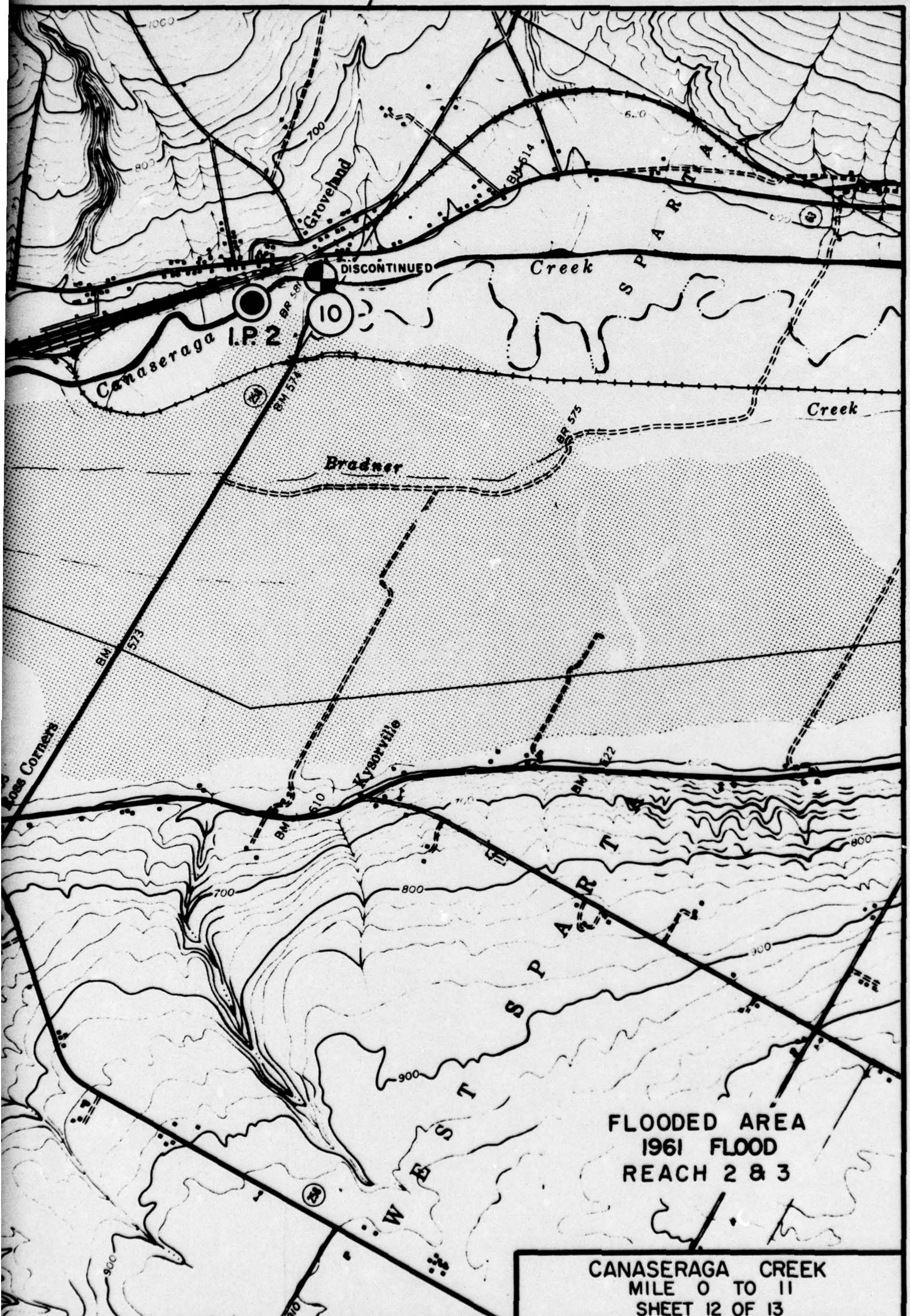

REACH 14
REACH 13
141
I.P. 14
FLOW
I.P. 13
139
STANNARDS CORNERS
FLOODED AREA
1950 FLOOD
SHONGO
UPPER GENESEE RIVER
MILE 139 TO 148
SHEET 11 OF 13

PLATE F 13

Flow
Hampton Corners
Canaseraga
Creek
REACH 3
Shaker Crossing
MT MORRIS
LEICESTER
RIVER
GENESEE
DUTCH
CORNERS
RD
JONES
ROAD
PENNSYLVANIA
Junction
BM 587
D
L
W
Mount Morris
Buck
Run
BM 604
BM 598
BM 607
BR 598
BM 593
0
2

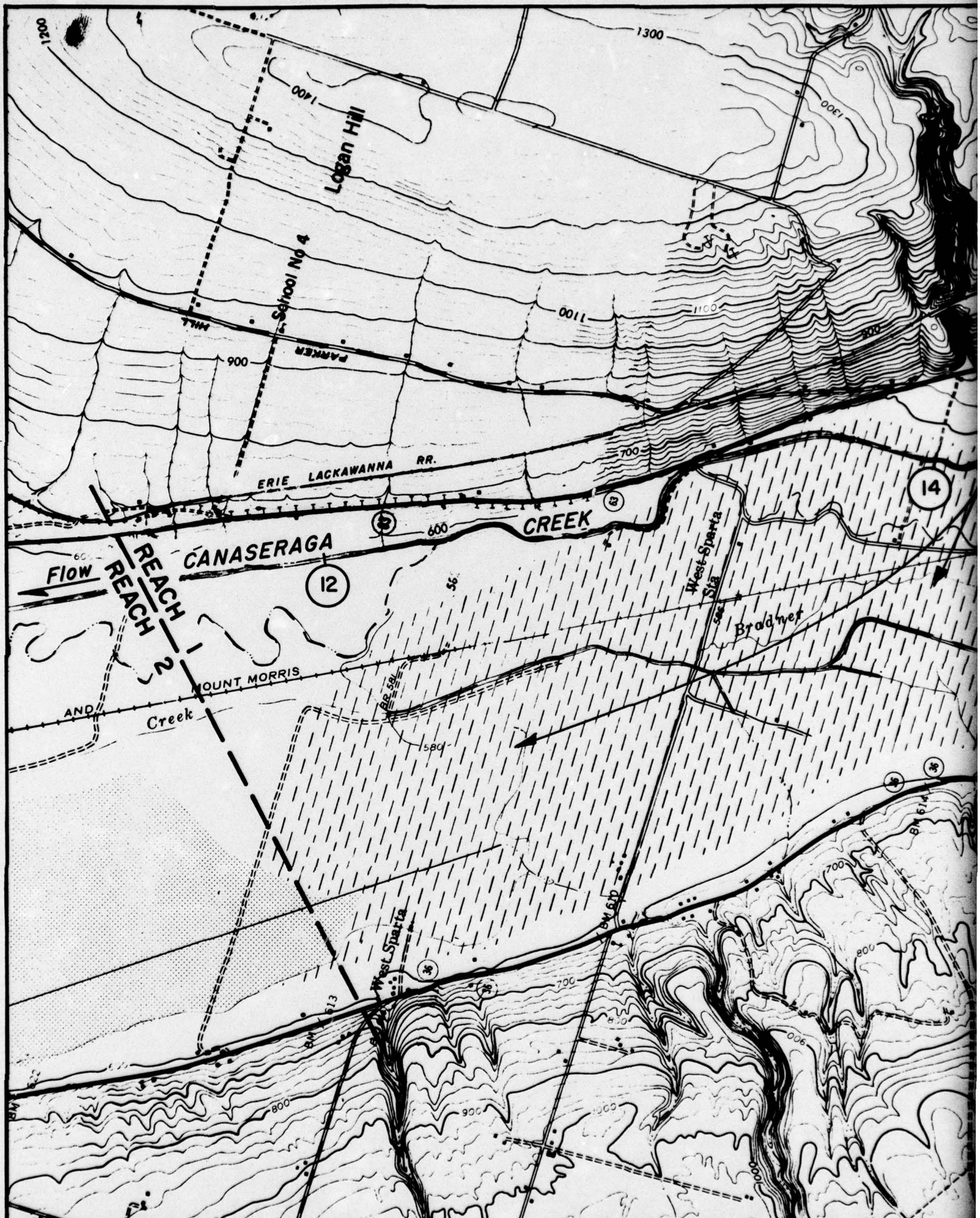
Canaseraga
Flow
Creek
CANASERAGA
CANAL
2
4
6
ERIE
LACKAWANNA
RR.
REACH 3
REACH 2
Creek
Buck
Run
Mount Morris
Sonyea
Craig Colony
Sewage Disposal
BM 598
BM 604
BM 609
BM 603
BM 625
800
700
600
580
560
1000
0
1000
2000
3000
4000
5000
6000

REACH 3
REACH 2
I.P. 3
I.P. 2
8
6
10
Canaseraga
Ponding
RR.
Sonyea
Craig Colony
Ross Corners
Creek
Sewage Disposal
BM 625
BM 605
BM 573
BM 574
1 MILE
4000
5000
6000
7000 FEET

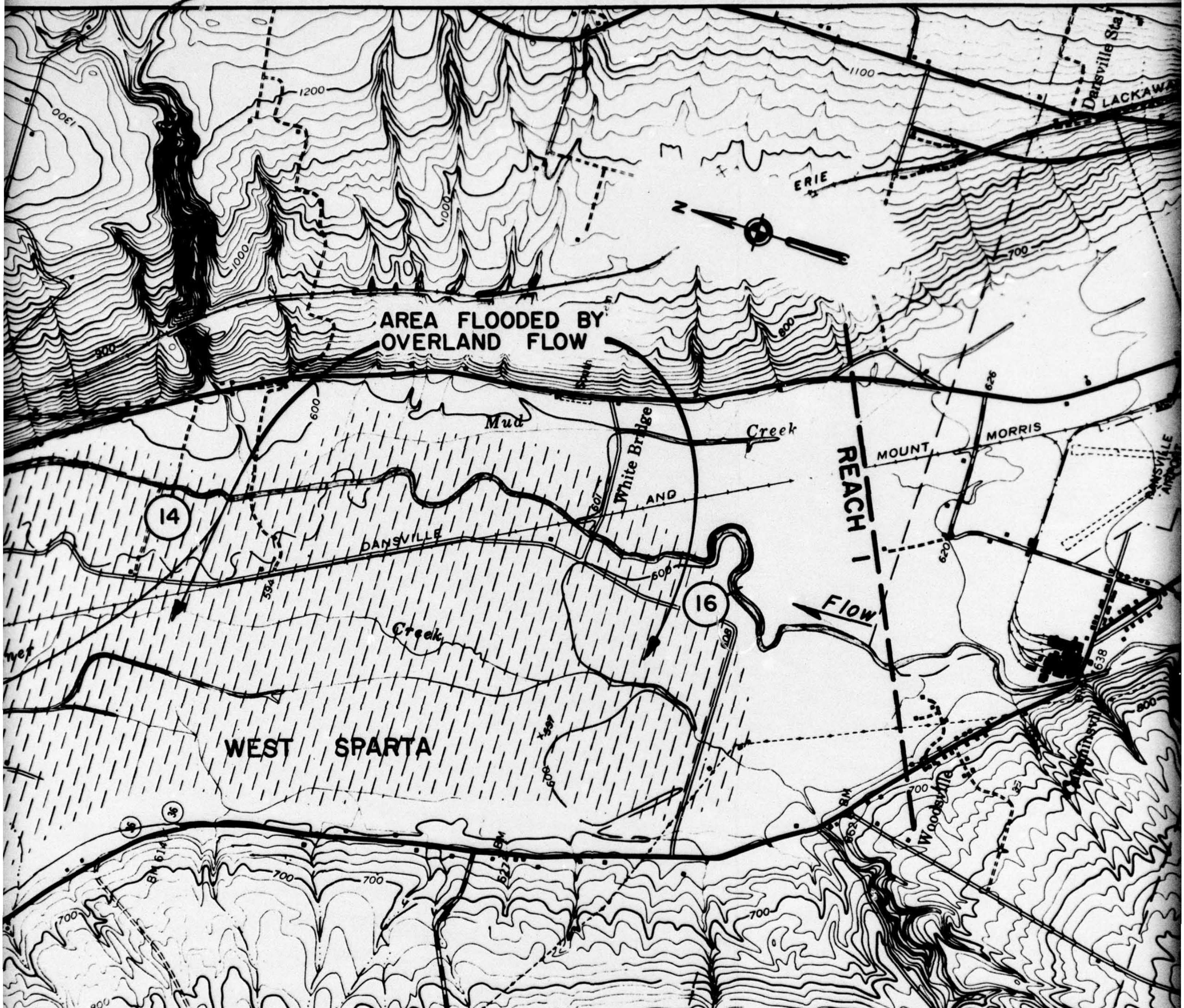


Groveland
DISCONTINUED
Creek
I.P. 2
10
Canaseraga
Creek
Bradner
SPARTA
Kysorville
Ross Corners
WEST SPARTA
FLOODED AREA
1961 FLOOD
REACH 2 & 3
CANASERAGA CREEK
MILE 0 TO 11
SHEET 12 OF 13

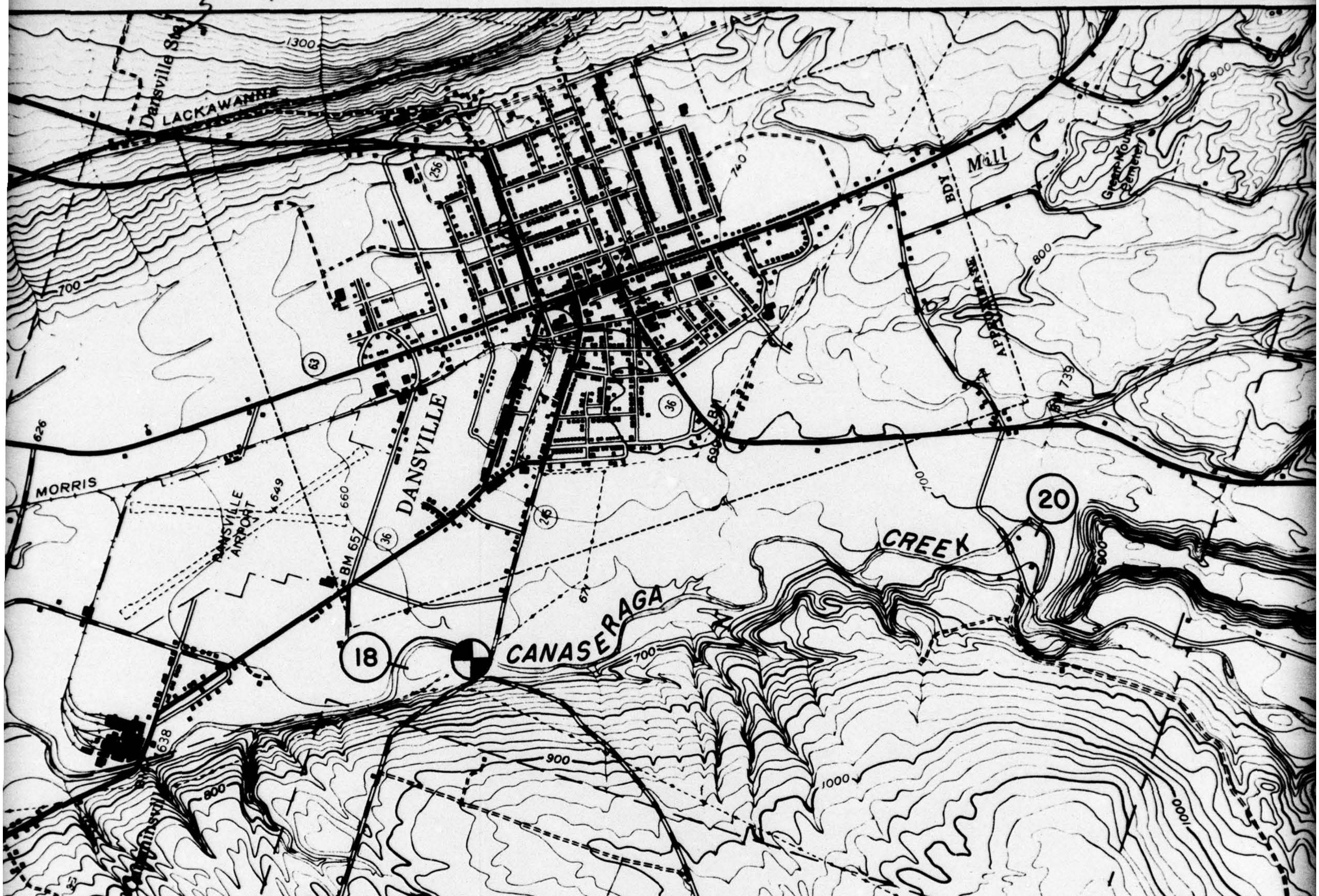
PLATE F 14


Logan Hill
School No 4
PARKER HILL
ERIE LACKAWANNA RR.
CANASERAGA CREEK
Flow
REACH
REACH
2
12
14
MOUNT MORRIS
AND
Creek
West Sparta Sta
Bradner
West Sparta
1300
1400
1200
1100
900
700
600
580
800
1000

2-1

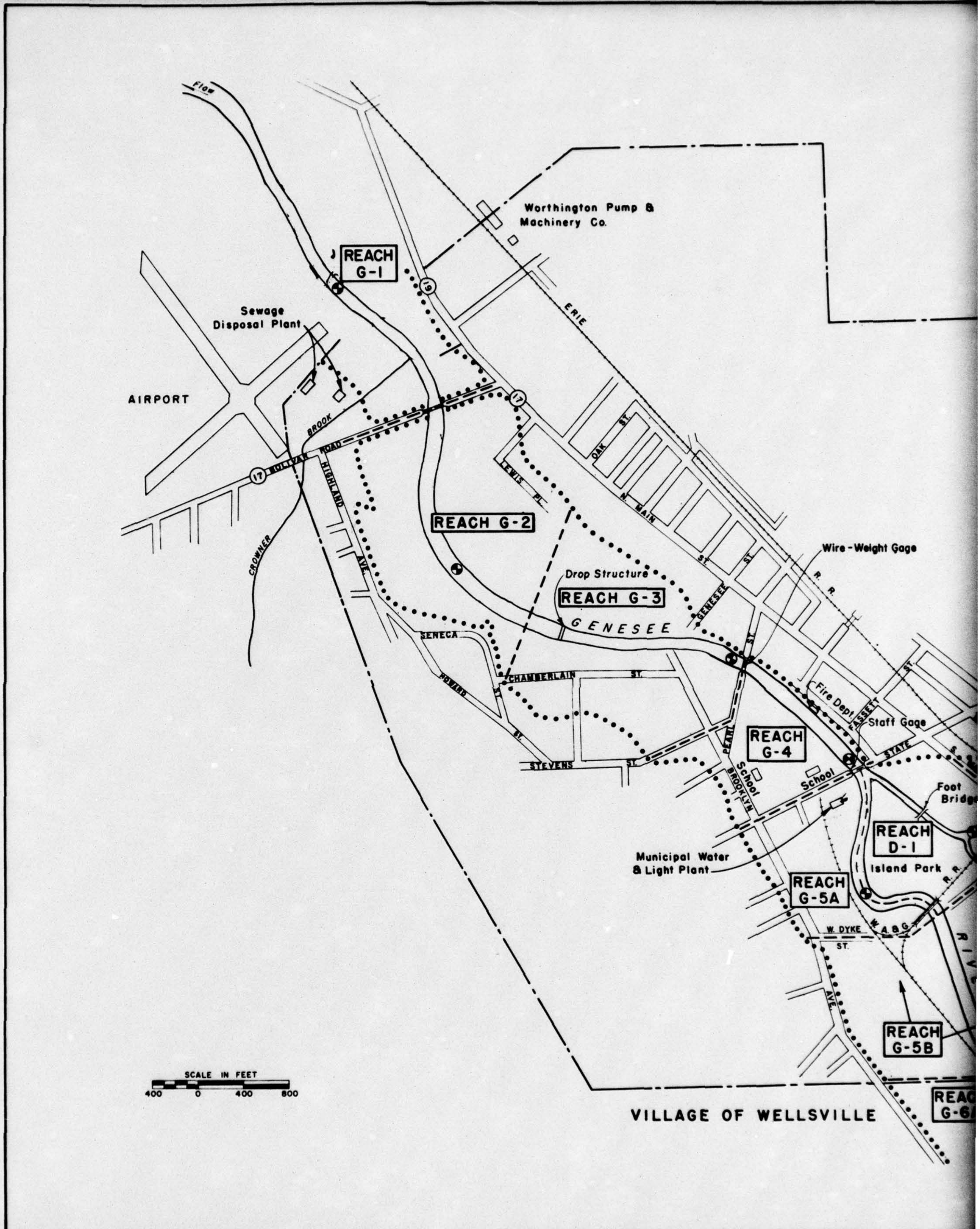

AREA FLOODED BY
OVERLAND FLOW
REACH I
Flow
WEST SPARTA
Mud
Creek
Creek
White Bridge
DANSVILLE
AND
MOUNT
MORRIS
ERIE
LACKAWA
Dansville Sta
DANSVILLE
AIRPORT
Woodsville
14
16
1200
1100
1000
900
800
700
600
1300
1000
0
1000
2000
3000
4000
5000
6000

3 1


Dansville Sta
LACKAWANNA
1300
Mill
BDY
900
700
800
63
DANSVILLE
36
626
MORRIS
DANSVILLE AIRPORT
649
660
BM 657
20
CREEK
739
CANASERAGA
18
638
1000
School No 1
1100
1200
1400
1500
1600
1051
BM
1 MILE
4000
5000
6000
7000 FEET


Mill
Green Mount Cemetery
Greenlawn Cem
SHAWMUT
PITTSBURG
BM 1148
BM 985
BM 739
BM 1272
Stony
STONY BROOK STATE
Stony Brook Glen
Flow
20
22
STEUBEN CO
LIVINGSTON CO
FLOODED AREA
1961 FLOOD
REACH 1
CANASERAGA CREEK
MILE 11 TO 23
SHEET 13 OF 13

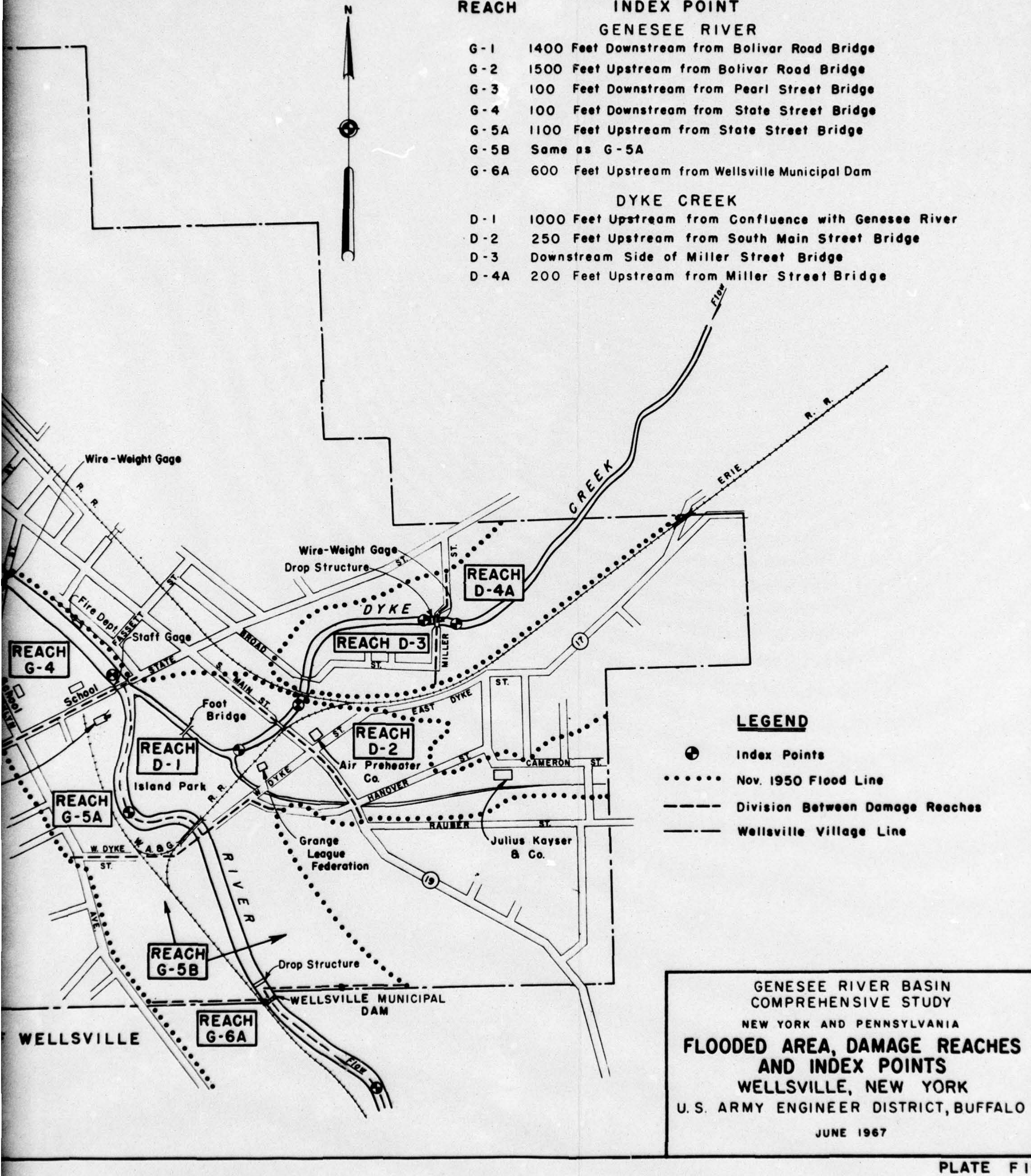
PLATE F 15



Flow
Worthington Pump & Machinery Co.
REACH G-1
Sewage Disposal Plant
AIRPORT
ERIE
BOLIVAR ROAD
BROOK
HIGHLAND AVE.
CROWNER
LEWIS PL.
OAK ST.
N. MAIN ST.
REACH G-2
Wire-Weight Gage
R. R.
Drop Structure
REACH G-3
GENESEE
GENESEE ST.
SENECA
CHAMBERLAIN ST.
HOWARD ST.
Fire Dept.
FASSETT
Staff Gage
STATE
PEARL
BROOKLYN
REACH G-4
School
School
STEVENS ST.
Foot Bridge
REACH D-1
Island Park
Municipal Water & Light Plant
REACH G-5A
W. DYKE ST.
W. A. & G.
REACH G-5B
SCALE IN FEET
400 0 400 800
VILLAGE OF WELLSVILLE

DAMAGE REACHES

REACH	INDEX POINT
	GENESEE RIVER
G - 1	1400 Feet Downstream from Bolivar Road Bridge
G - 2	1500 Feet Upstream from Bolivar Road Bridge
G - 3	100 Feet Downstream from Pearl Street Bridge
G - 4	100 Feet Downstream from State Street Bridge
G - 5A	1100 Feet Upstream from State Street Bridge
G - 5B	Same as G - 5A
G - 6A	600 Feet Upstream from Wellsville Municipal Dam
	DYKE CREEK
D - 1	1000 Feet Upstream from Confluence with Genesee River
D - 2	250 Feet Upstream from South Main Street Bridge
D - 3	Downstream Side of Miller Street Bridge
D - 4A	200 Feet Upstream from Miller Street Bridge



LEGEND

- Index Points
- Nov. 1950 Flood Line
- Division Between Damage Reaches
- Wellsville Village Line

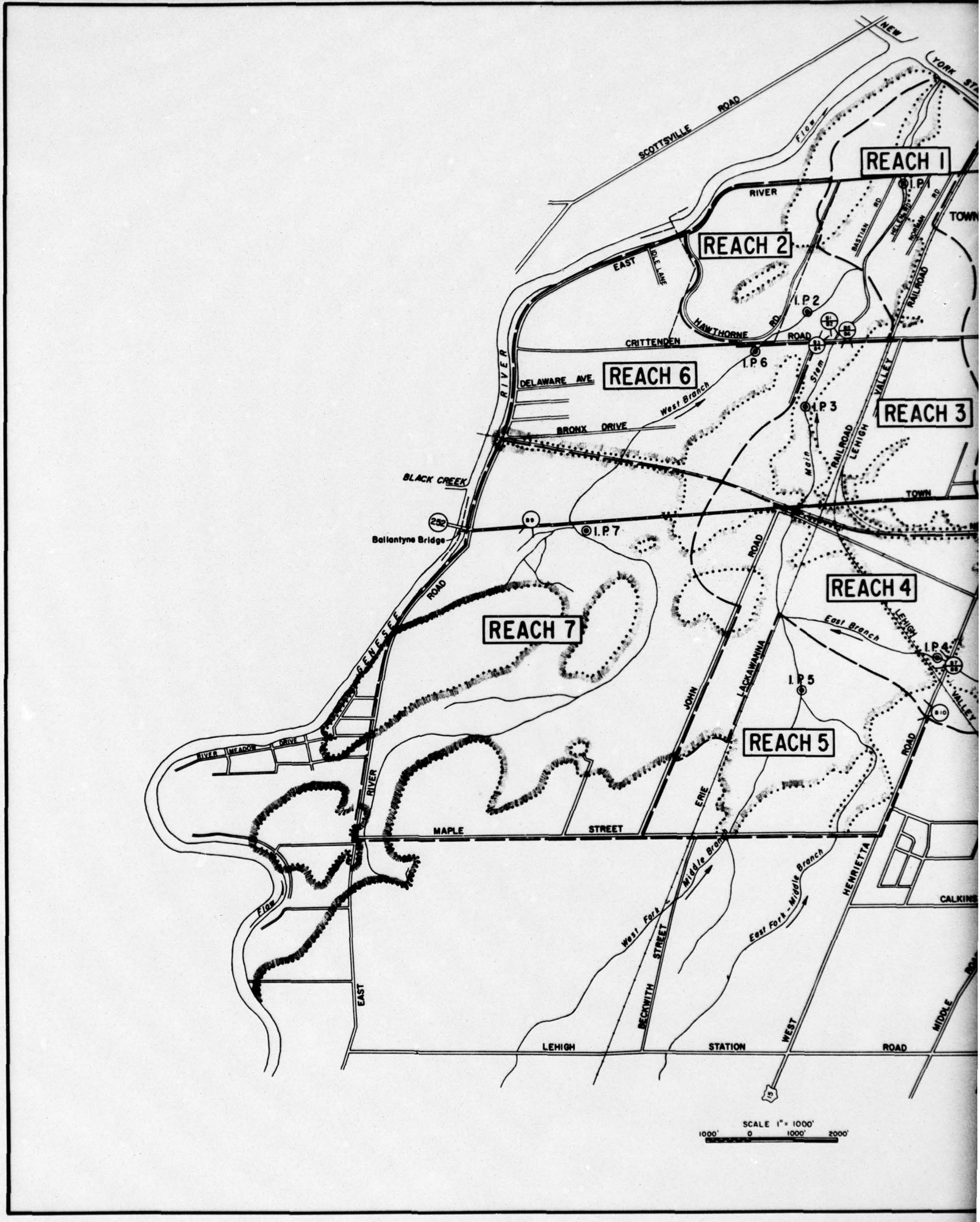
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

FLOODED AREA, DAMAGE REACHES AND INDEX POINTS
WELLSVILLE, NEW YORK

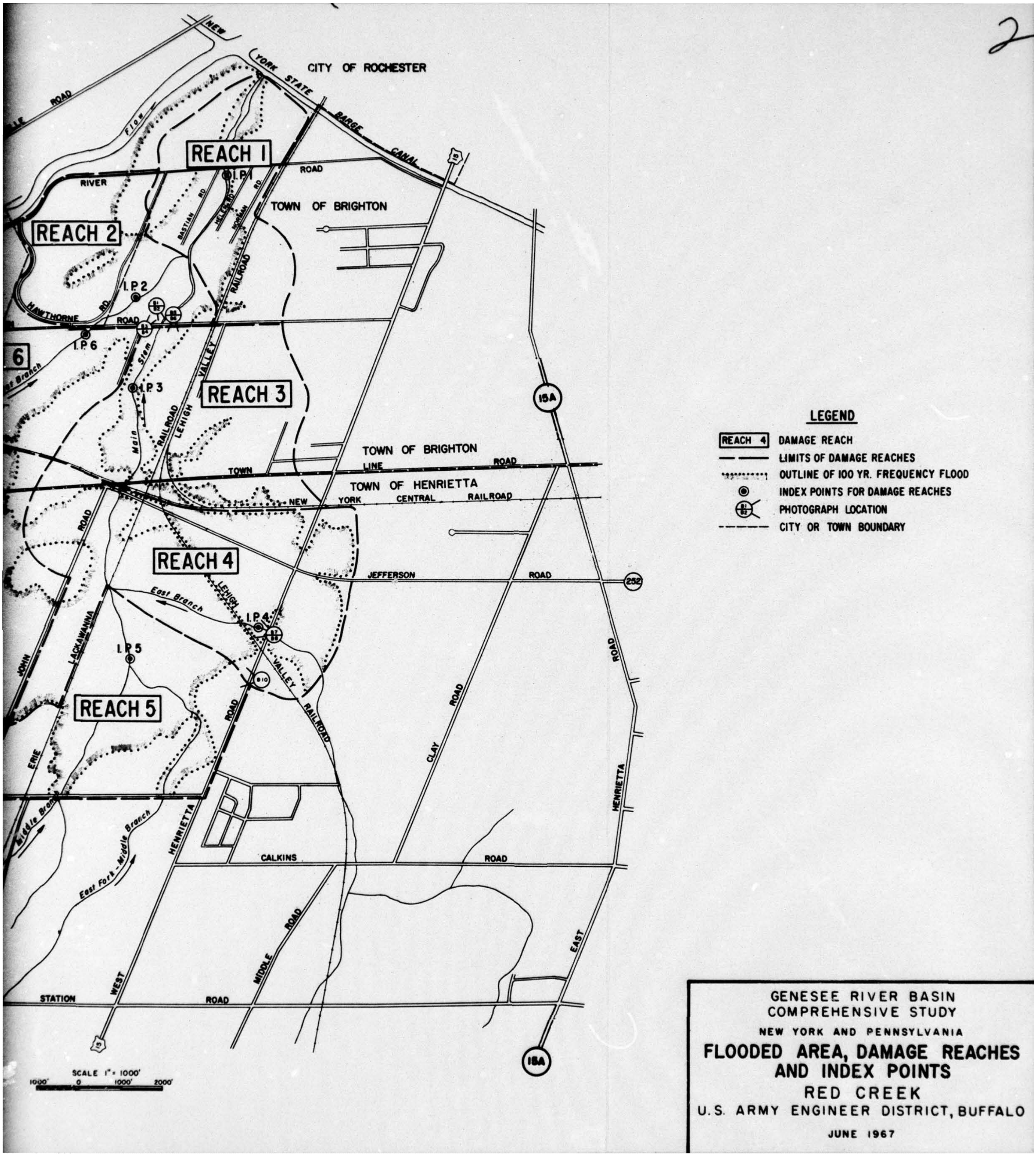
U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

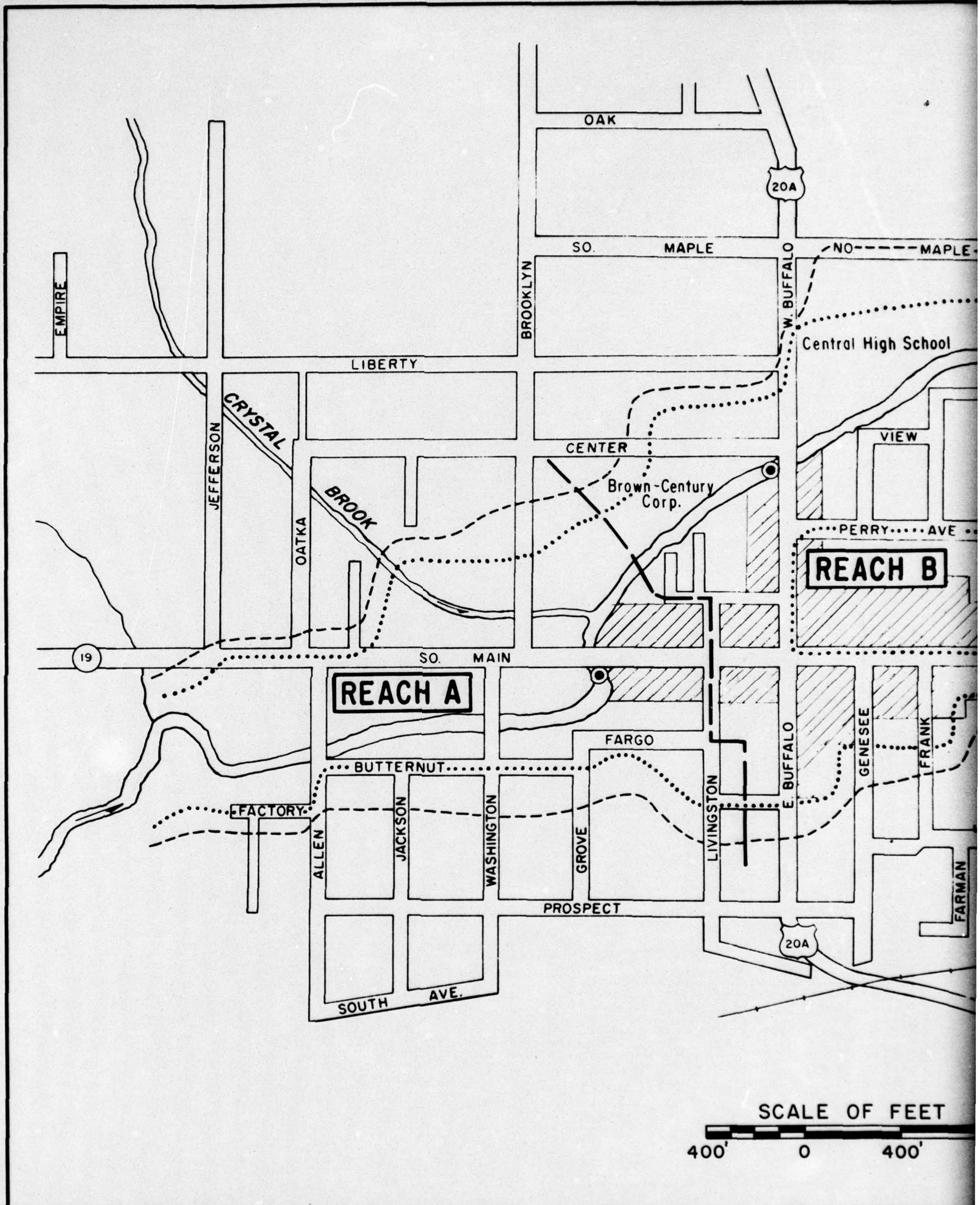
PLATE F16



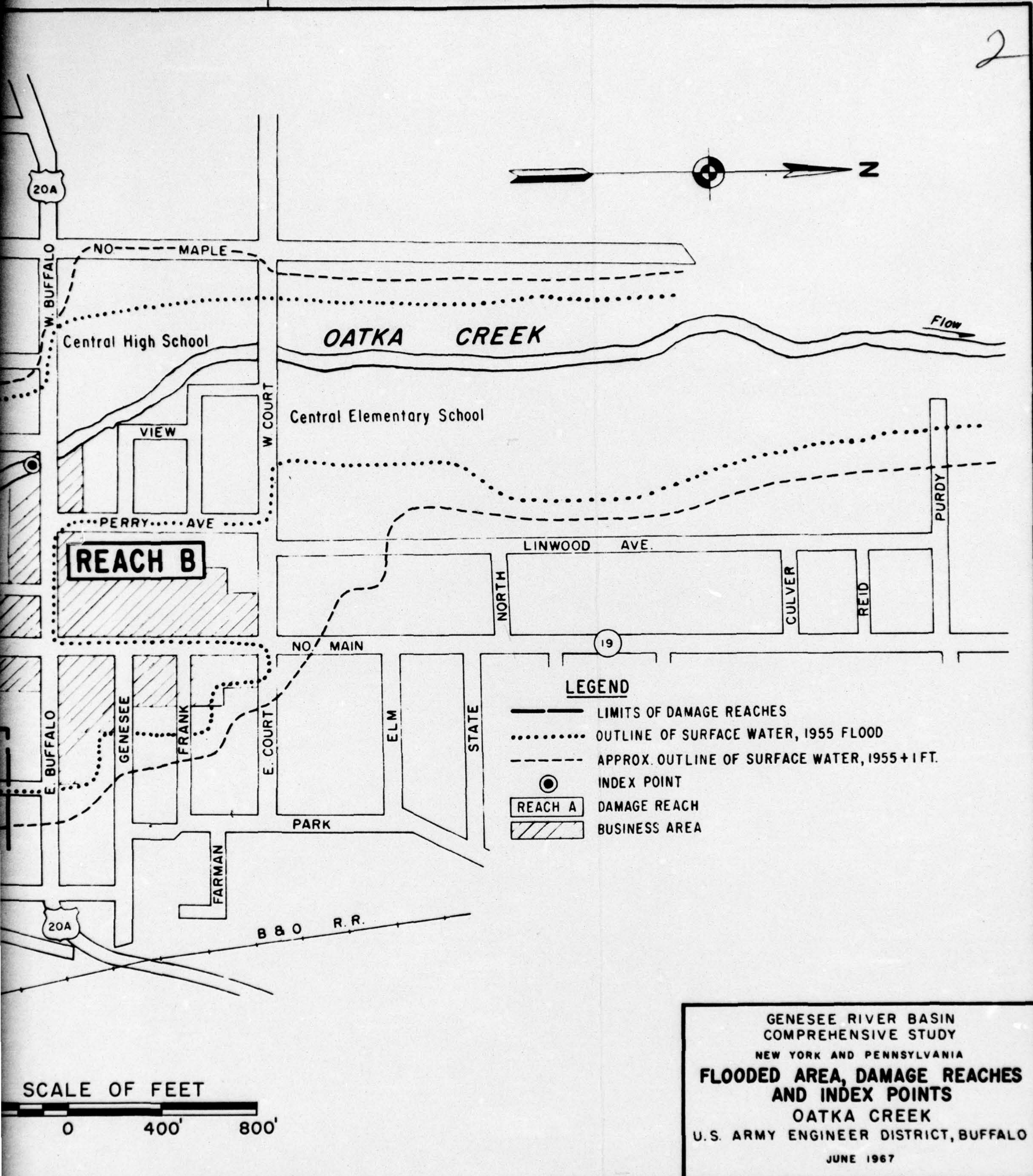
NEW YORK STATE
SCOTTSVILLE ROAD
Flow
REACH 1
I.P.1
RIVER
TOWN
BASTIAN RD
HELENDALE RD
NORMAN RD
RAILROAD
REACH 2
EAST
IDLE LANE
I.P.2
HAWTHORNE RD
CRITTENDEN
ROAD
I.P.6
REACH 6
DELAWARE AVE.
RIVER
West Branch
Stem
Main
I.P.3
REACH 3
LEHIGH
VALLEY
RAILROAD
BRONX DRIVE
BLACK CREEK
TOWN
252
I.P.7
Ballantyne Bridge
ROAD
REACH 4
East Branch
LEHIGH
VALLEY
I.P.4
GENESEE
REACH 7
JOHN
LACKAWANNA
I.P.5
ROAD
REACH 5
RIVER MEADOW DRIVE
RIVER
ERIE
MAPLE
STREET
Middle Branch
HENRIETTA
CALKINS
Flow
West Fork
East Fork - Middle Branch
STREET
BECKWITH
EAST
WEST
MIDDLE
LEHIGH
STATION
ROAD
15
SCALE 1" = 1000'
1000'
0
1000'
2000'



2
CITY OF ROCHESTER
NEW YORK STATE BARGE CANAL
REACH 1
REACH 2
REACH 3
REACH 4
REACH 5
6
I.P.1
I.P.2
I.P.3
I.P.4
I.P.5
I.P.6
RIVER
ROAD
TOWN OF BRIGHTON
TOWN OF HENRIETTA
TOWN LINE ROAD
NEW YORK CENTRAL RAILROAD
LEHIGH VALLEY RAILROAD
ERIE LACKAWANNA RAILROAD
HAWTHORNE RD
JEFFERSON ROAD
CALKINS ROAD
STATION ROAD
CLAY ROAD
EAST HENRIETTA ROAD
WEST HENRIETTA ROAD
MIDDLE ROAD
JOHN
Main Stem
East Branch
Middle Branch
East Fork - Middle Branch
Flow
15
15A
252
SCALE 1" = 1000'
1000' 0 1000' 2000'
LEGEND
REACH 4 DAMAGE REACH
LIMITS OF DAMAGE REACHES
OUTLINE OF 100 YR. FREQUENCY FLOOD
INDEX POINTS FOR DAMAGE REACHES
PHOTOGRAPH LOCATION
CITY OR TOWN BOUNDARY
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
FLOODED AREA, DAMAGE REACHES
AND INDEX POINTS
RED CREEK
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967



OAK
20A
SO. MAPLE
NO MAPLE
W. BUFFALO
EMPIRE
BROOKLYN
Central High School
LIBERTY
JEFFERSON
CRYSTAL
CENTER
VIEW
Brown-Century Corp.
OATKA
BROOK
PERRY AVE
REACH B
19
SO. MAIN
REACH A
FARGO
BUTTERNUT
FACTORY
E. BUFFALO
GENESEE
FRANK
ALLEN
JACKSON
WASHINGTON
GROVE
LIVINGSTON
PROSPECT
FARMAN
20A
SOUTH AVE.
SCALE OF FEET
400'
0
400'



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

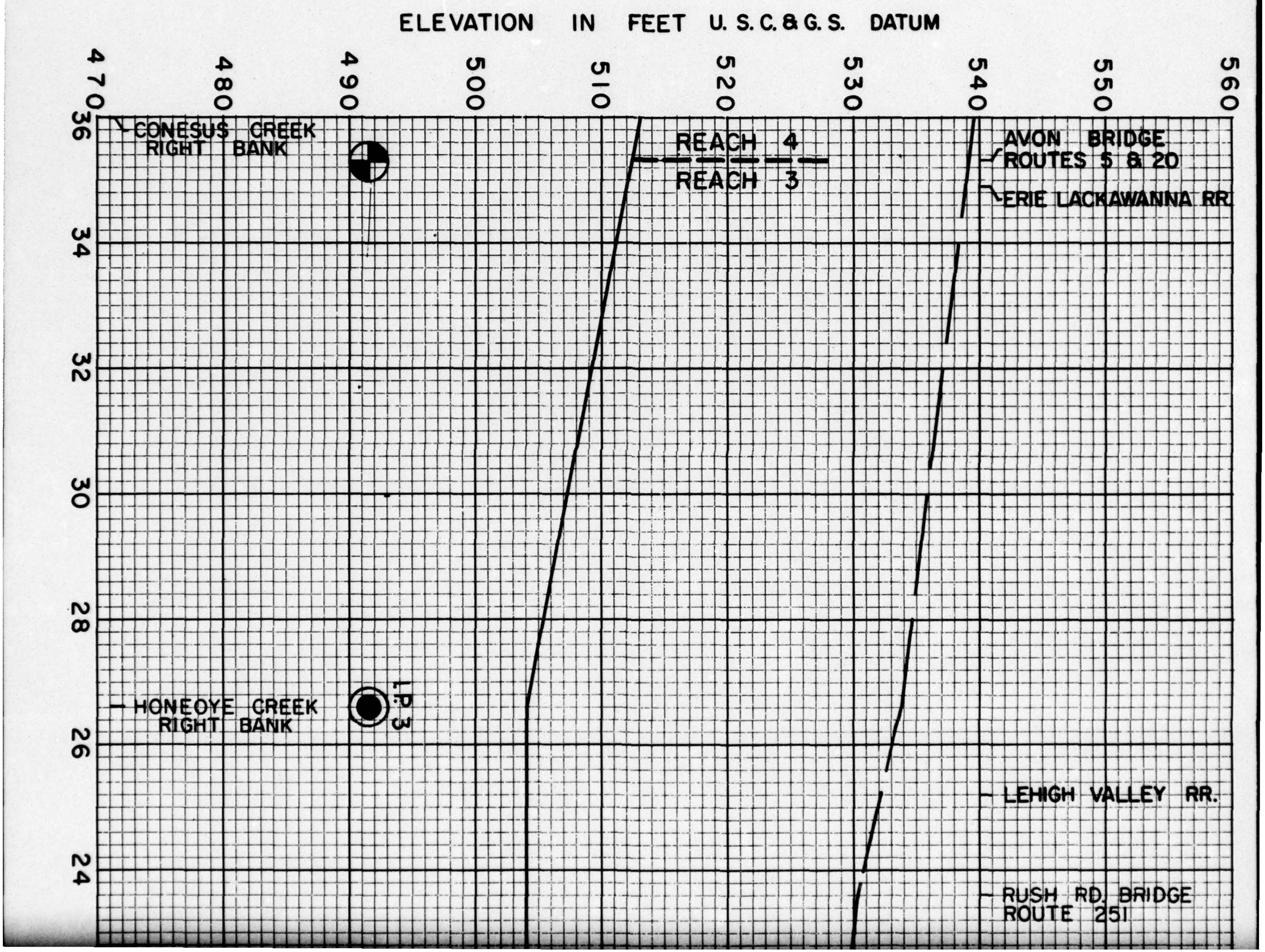
FLOODED AREA, DAMAGE REACHES AND INDEX POINTS

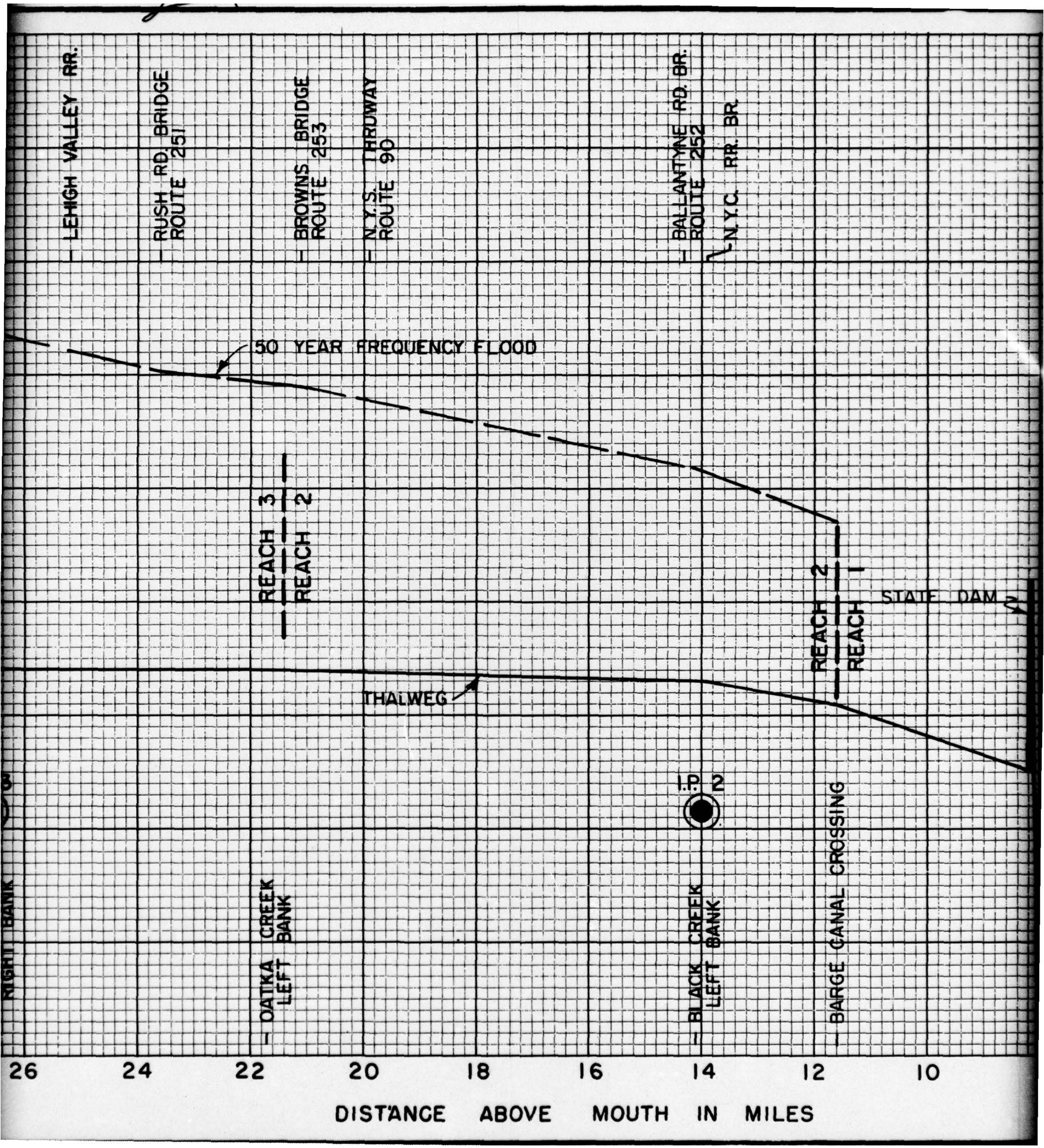
OATKA CREEK

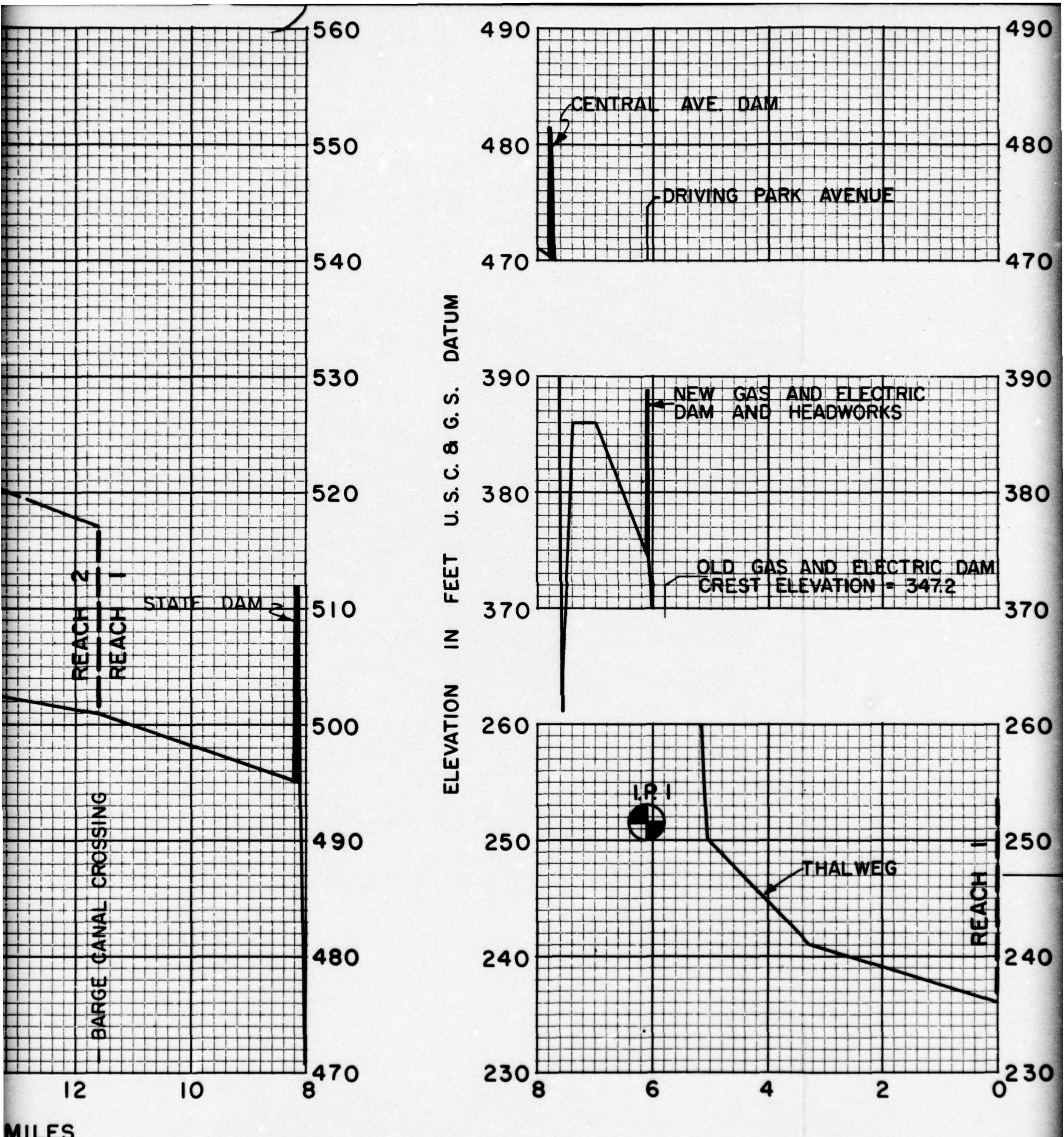
U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

PLATE F 18

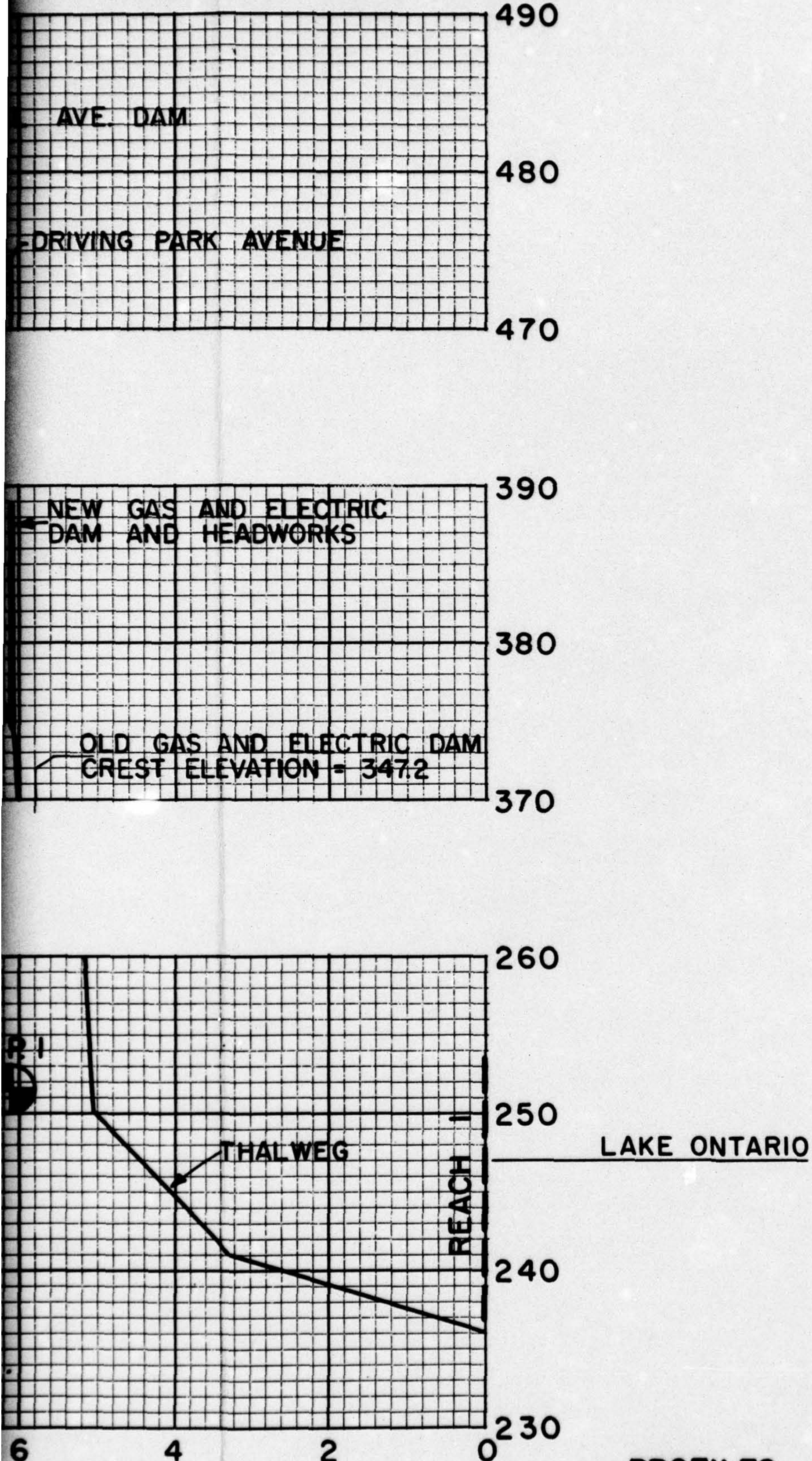

ELEVATION IN FEET U. S. C. & G. S. DATUM
470
480
490
500
510
520
530
540
550
560
36
34
32
30
28
26
24
CONESUS CREEK RIGHT BANK
HONEOYE CREEK RIGHT BANK
I.P. 3
REACH 4
REACH 3
AVON BRIDGE
ROUTES 5 & 20
ERIE LACKAWANNA RR.
LEHIGH VALLEY RR.
RUSH RD. BRIDGE
ROUTE 251


LEHIGH VALLEY RR.
RUSH RD. BRIDGE
ROUTE 251
BROWNS BRIDGE
ROUTE 253
N.Y.S. THRUWAY
ROUTE 90
BALLANTYNE RD. BR.
ROUTE 252
N.Y.C. RR. BR.
50 YEAR FREQUENCY FLOOD
REACH 3
REACH 2
REACH 2
REACH 1
STATE DAM
THALWEG
I.P. 2
RIGHT BANK
OATKA CREEK
LEFT BANK
BLACK CREEK
LEFT BANK
BARGE CANAL CROSSING
26
24
22
20
18
16
14
12
10
DISTANCE ABOVE MOUTH IN MILES

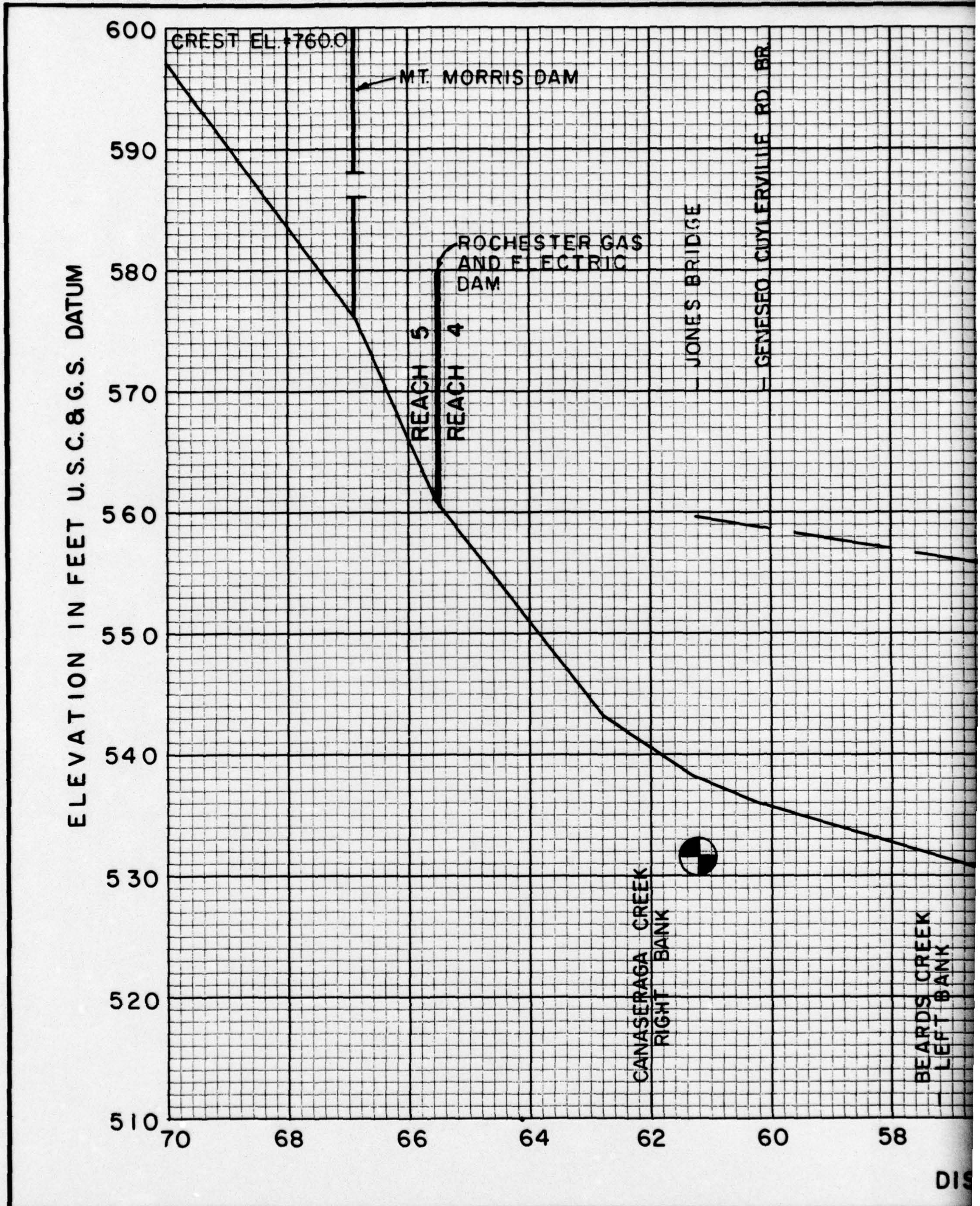


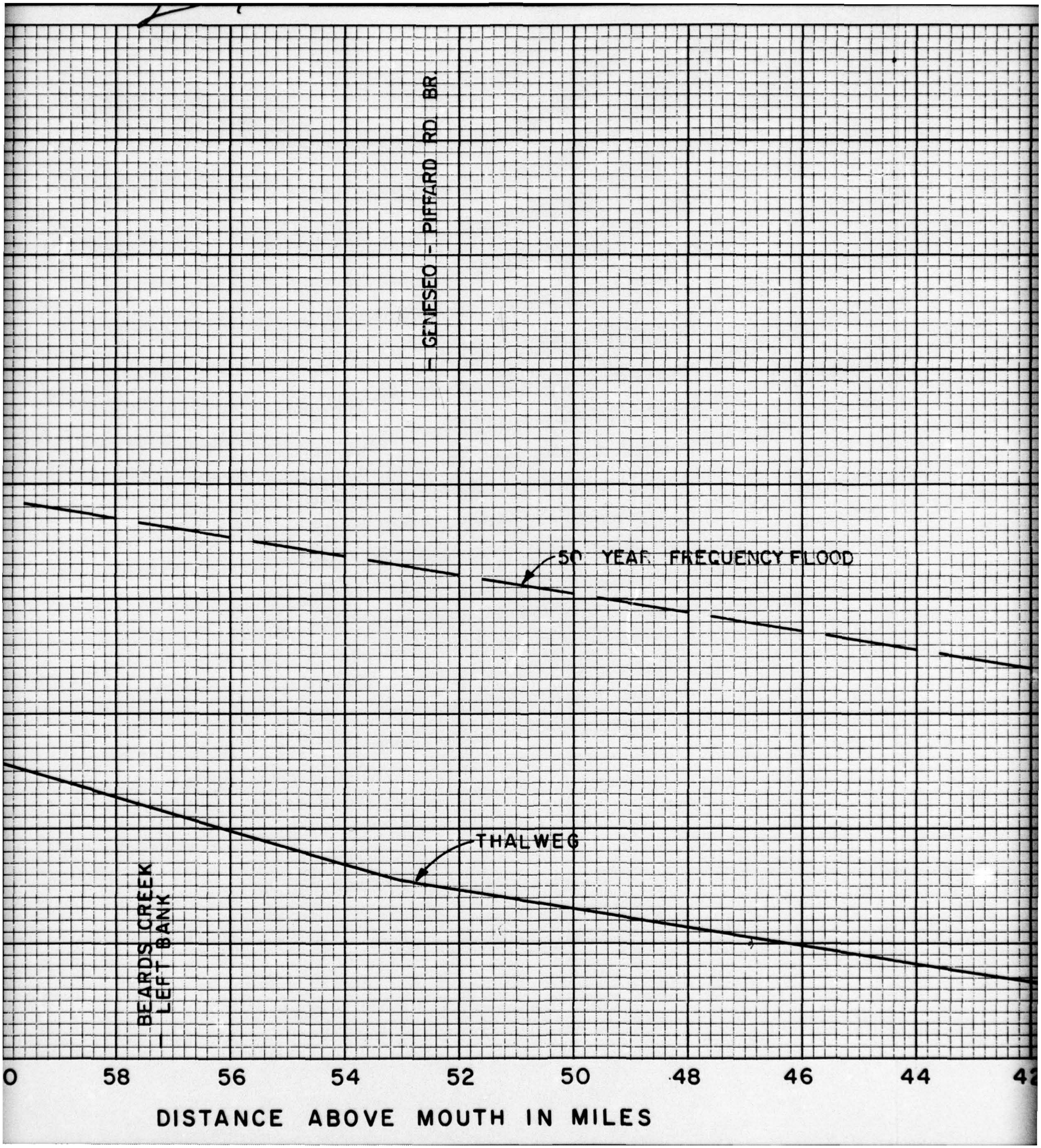
ELEVATION IN FEET U.S.C. & G.S. DATUM
MILES
CENTRAL AVE. DAM
DRIVING PARK AVENUE
NEW GAS AND ELECTRIC DAM AND HEADWORKS
OLD GAS AND ELECTRIC DAM CREST ELEVATION = 347.2
STATE DAM
REACH 2
REACH 1
BARGE CANAL CROSSING
I.P. 1
THALWEG
REACH 1
560
550
540
530
520
510
500
490
480
470
490
480
470
390
380
370
260
250
240
230
12
10
8
6
4
2
0

4

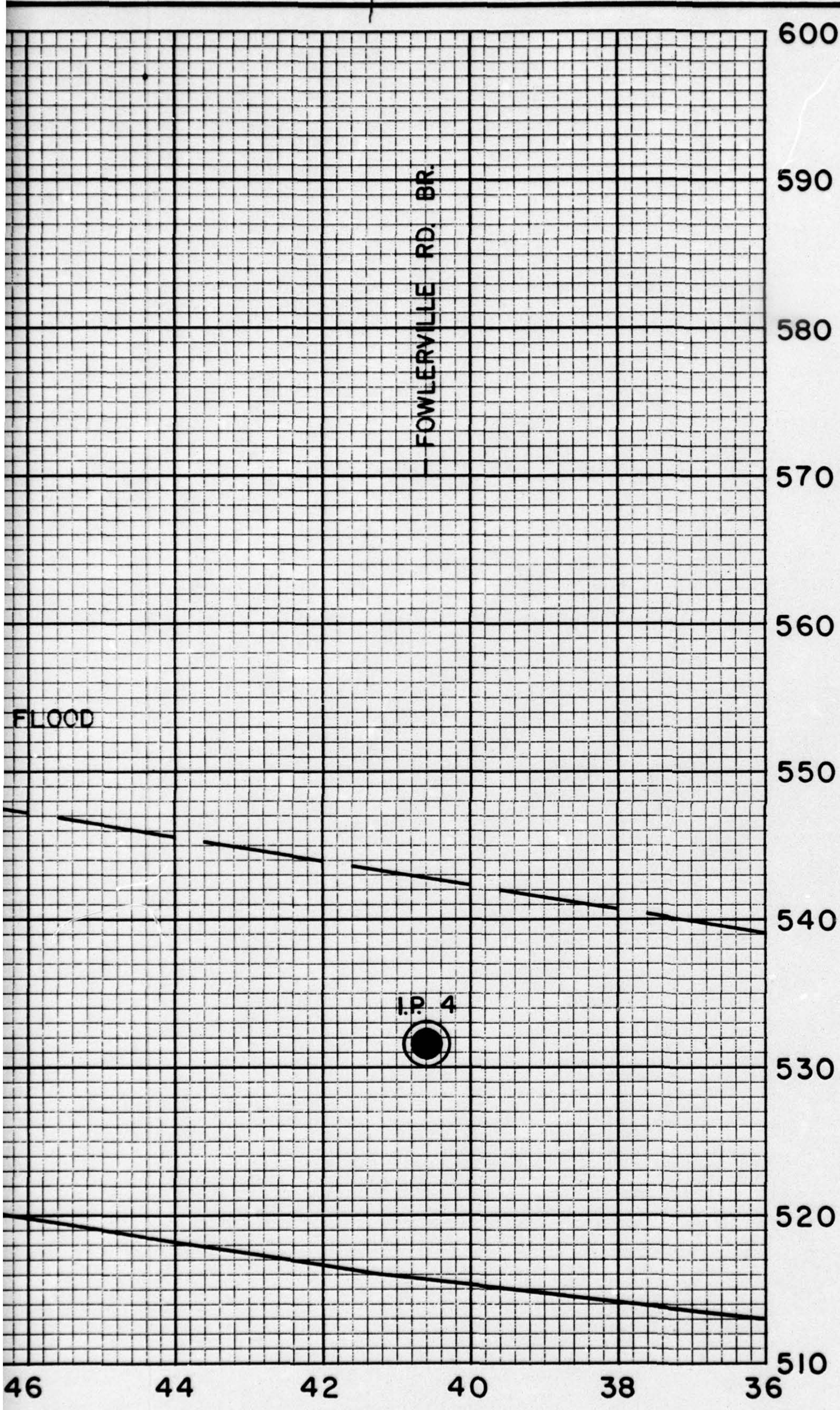


PROFILES
GENESEE RIVER
MILE 0 TO 36


CREST EL. +760.0
MT. MORRIS DAM
ROCHESTER GAS AND ELECTRIC DAM
REACH 5
REACH 4
JONES BRIDGE
GENESEO CUYLERVILLE RD. BR.
CANASERAGA CREEK RIGHT BANK
BEARDS CREEK LEFT BANK
ELEVATION IN FEET U.S.C.&G.S. DATUM
600
590
580
570
560
550
540
530
520
510
70
68
66
64
62
60
58
DIS

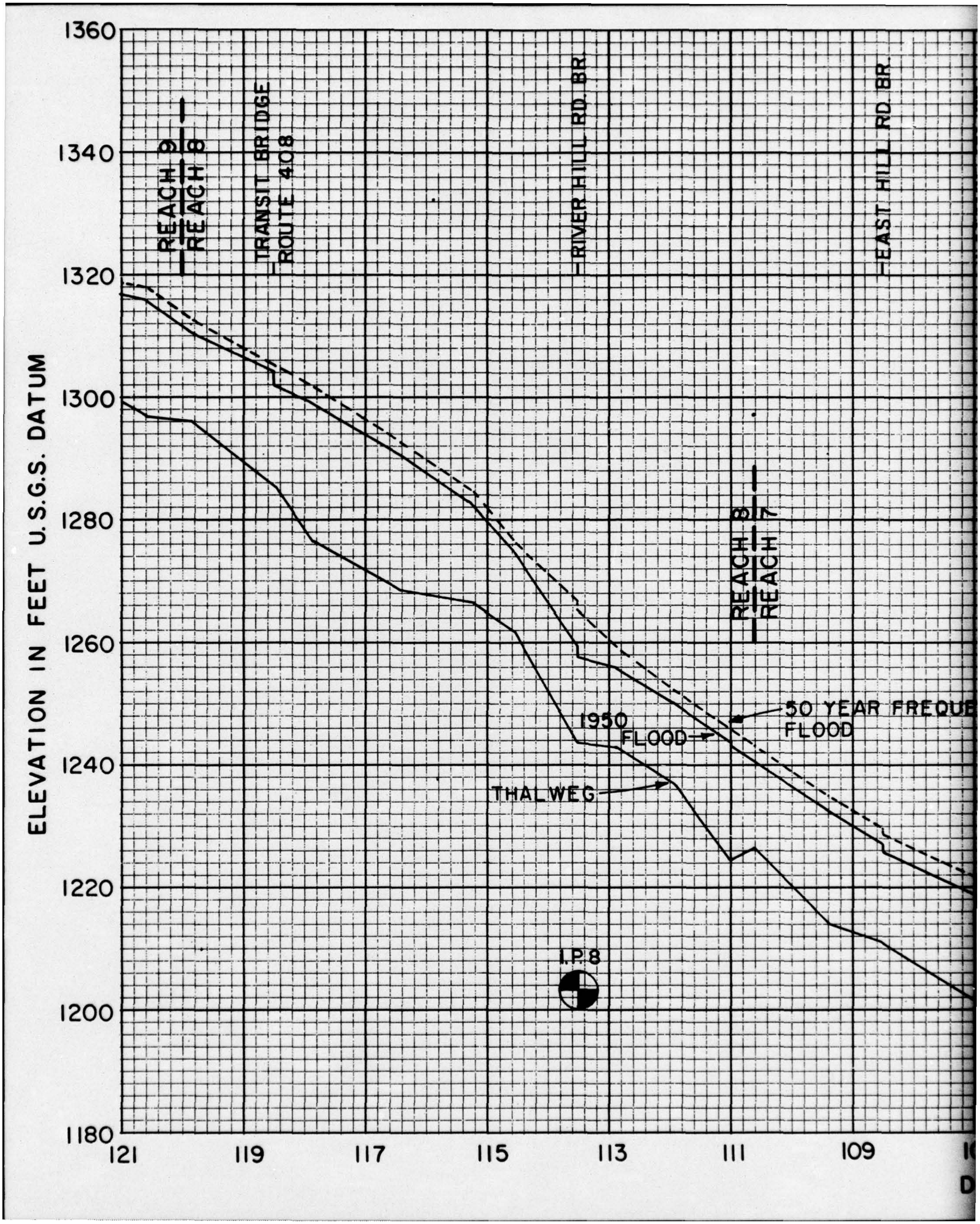

GENESEO - PIFFARD RD BR.
50 YEAR FREQUENCY FLOOD
THALWEG
BEARDS CREEK
LEFT BANK
58
56
54
52
50
48
46
44
DISTANCE ABOVE MOUTH IN MILES

3

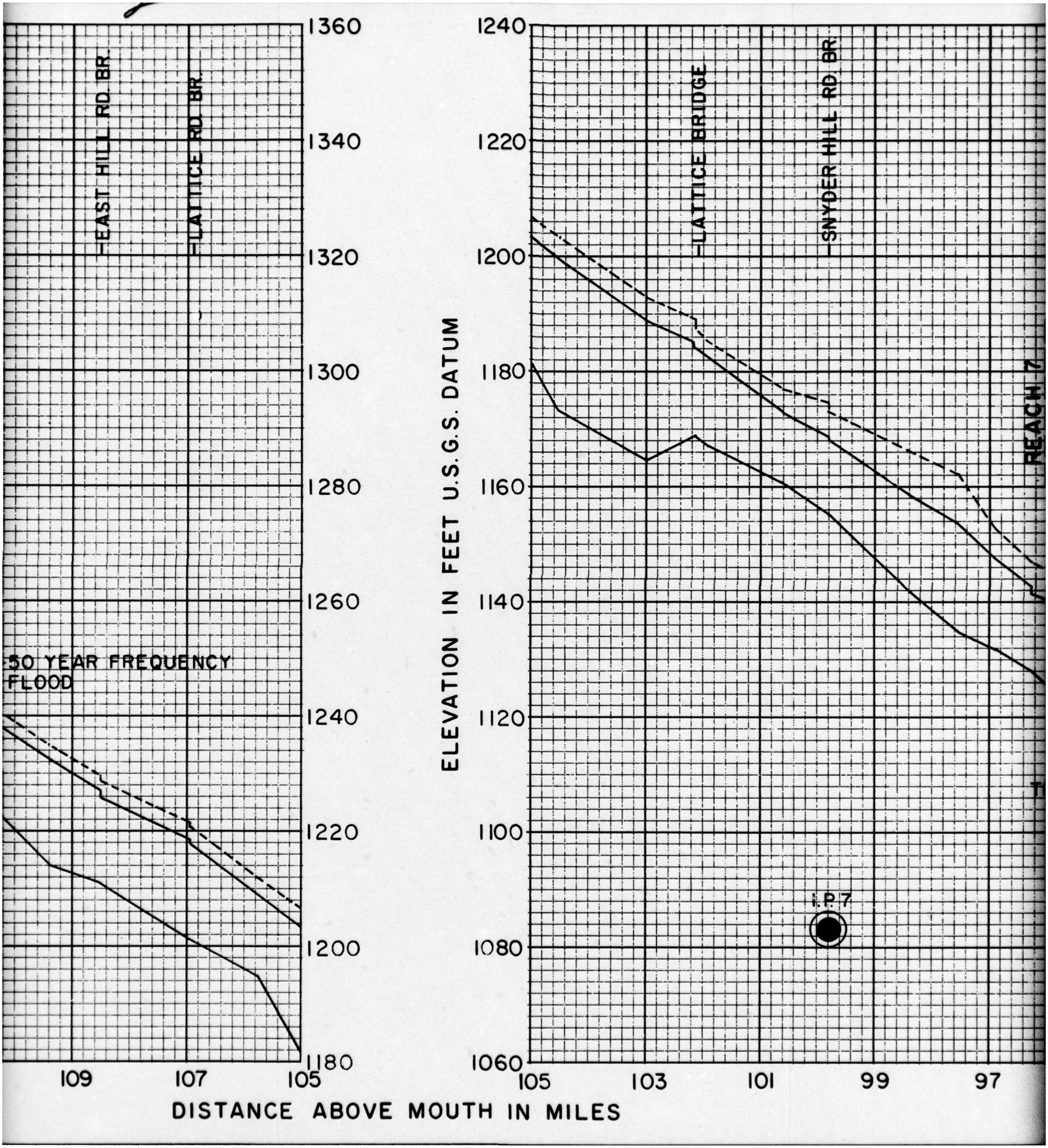


PROFILES
GENESEE RIVER
MILE 36 TO 70

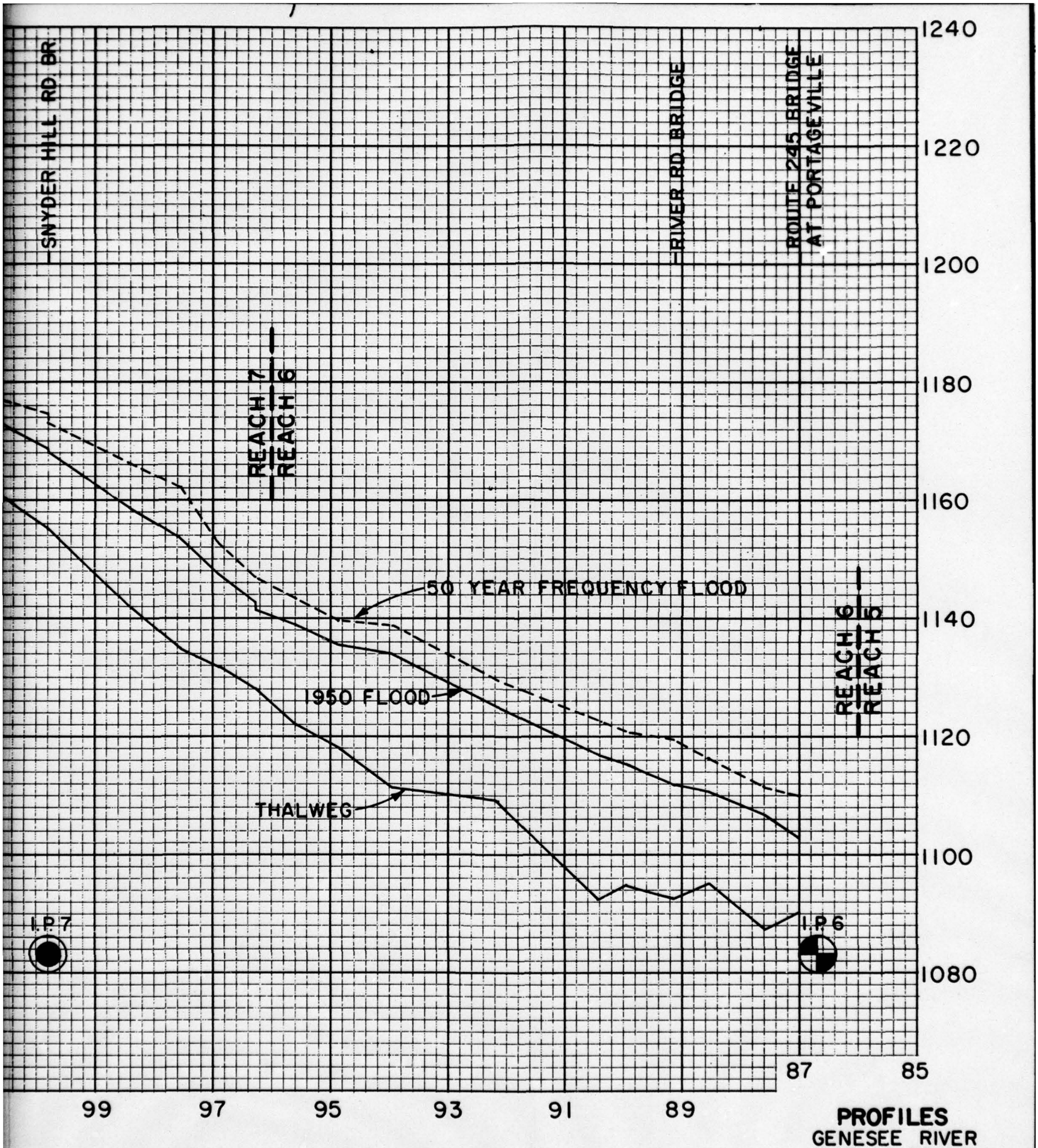
PLATE F 20



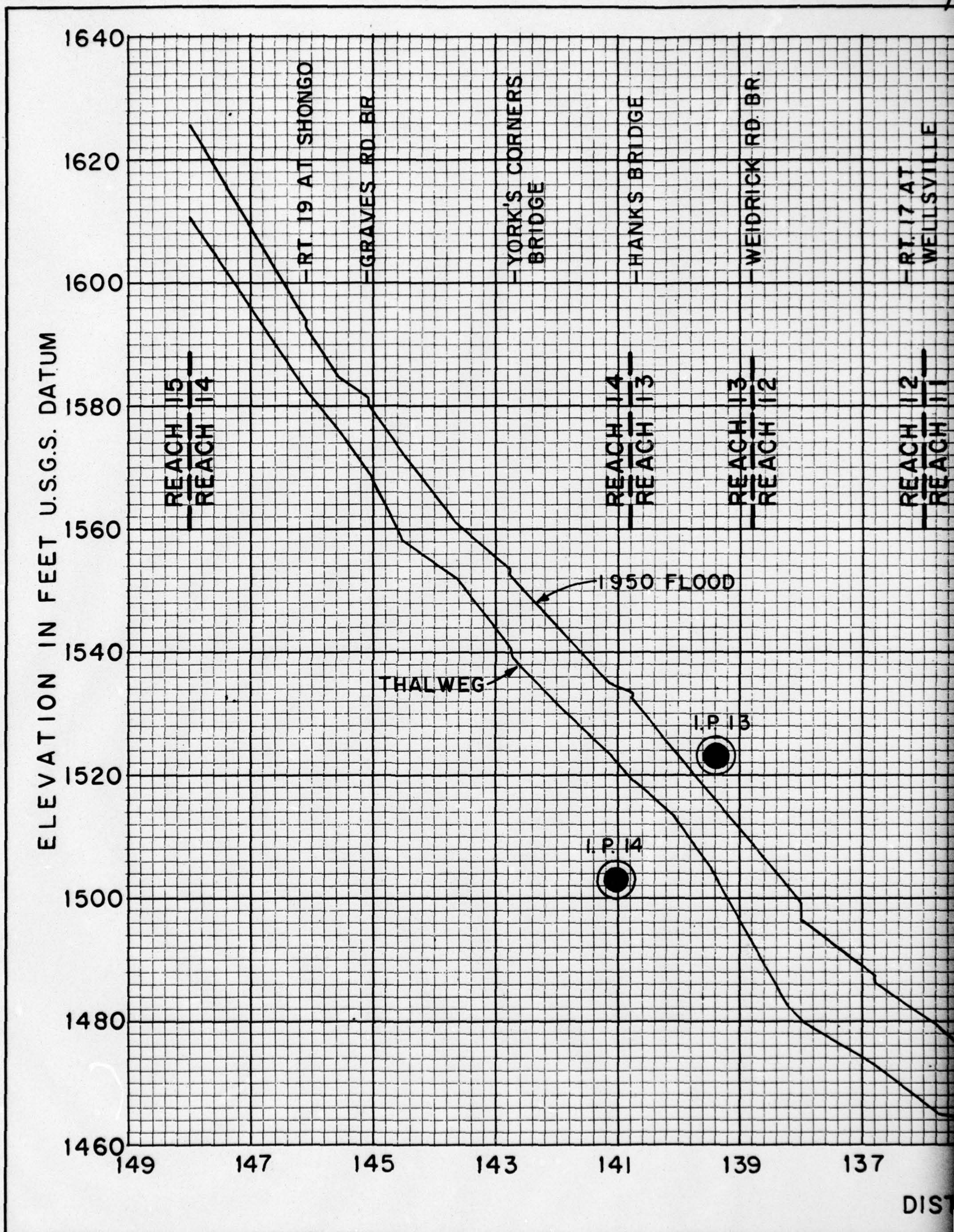
ELEVATION IN FEET U.S.G.S. DATUM
1360
1340
1320
1300
1280
1260
1240
1220
1200
1180
121
119
117
115
113
111
109
REACH 9
REACH 8
TRANSIT BRIDGE
ROUTE 408
RIVER HILL RD. BR.
EAST HILL RD. BR.
REACH 8
REACH 7
1950
FLOOD
50 YEAR FREQUE
FLOOD
THALWEG
I.P. 8



EAST HILL RD. BR.
LATTICE RD. BR.
50 YEAR FREQUENCY FLOOD
LATTICE BRIDGE
SNYDER HILL RD BR.
REACH 7
I.P.7
ELEVATION IN FEET U.S.G.S. DATUM
DISTANCE ABOVE MOUTH IN MILES
1360
1340
1320
1300
1280
1260
1240
1220
1200
1180
1160
1140
1120
1100
1080
1060
109
107
105
103
101
99
97

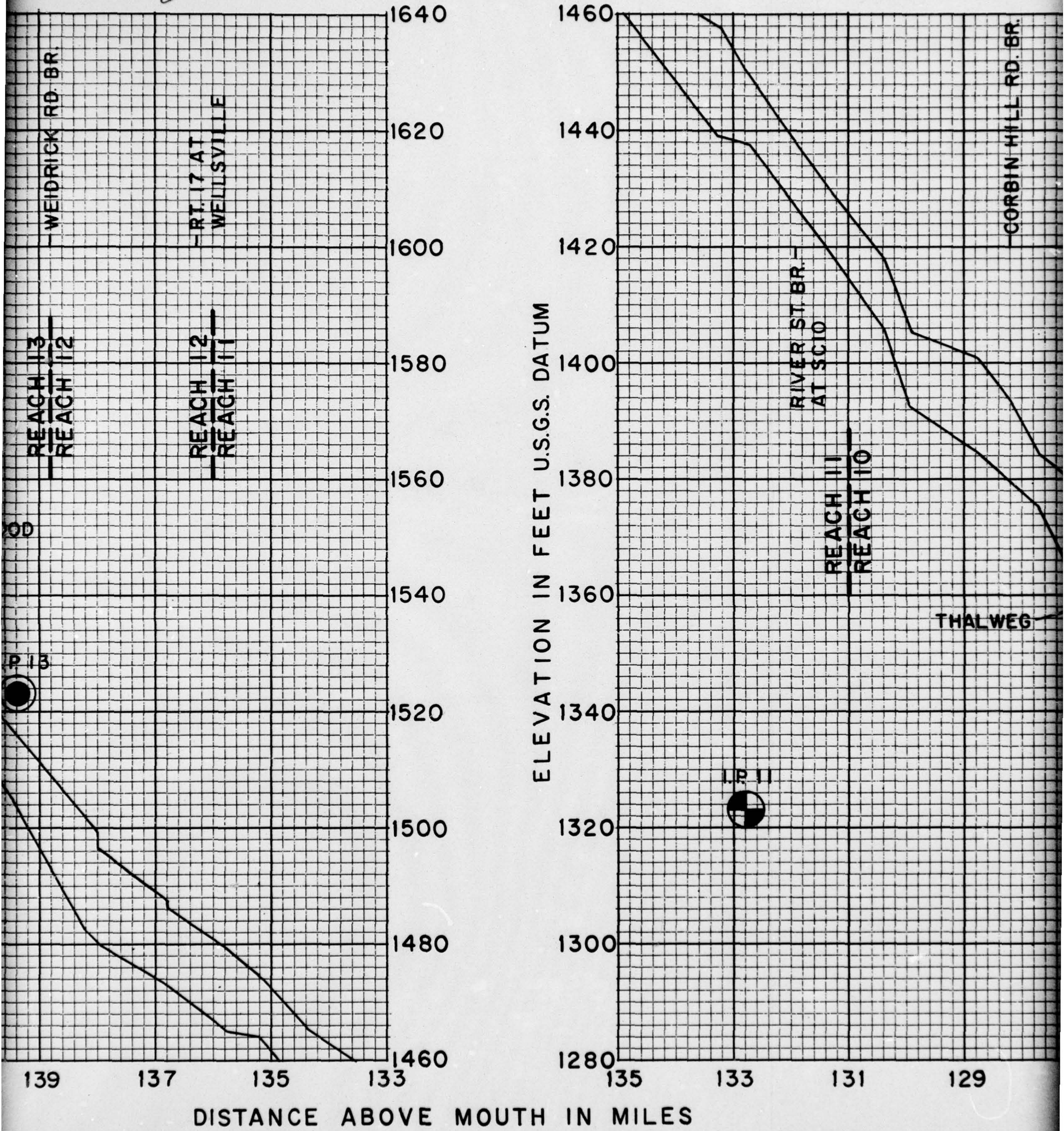


PROFILES
GENESEE RIVER
MILE 85 TO 121

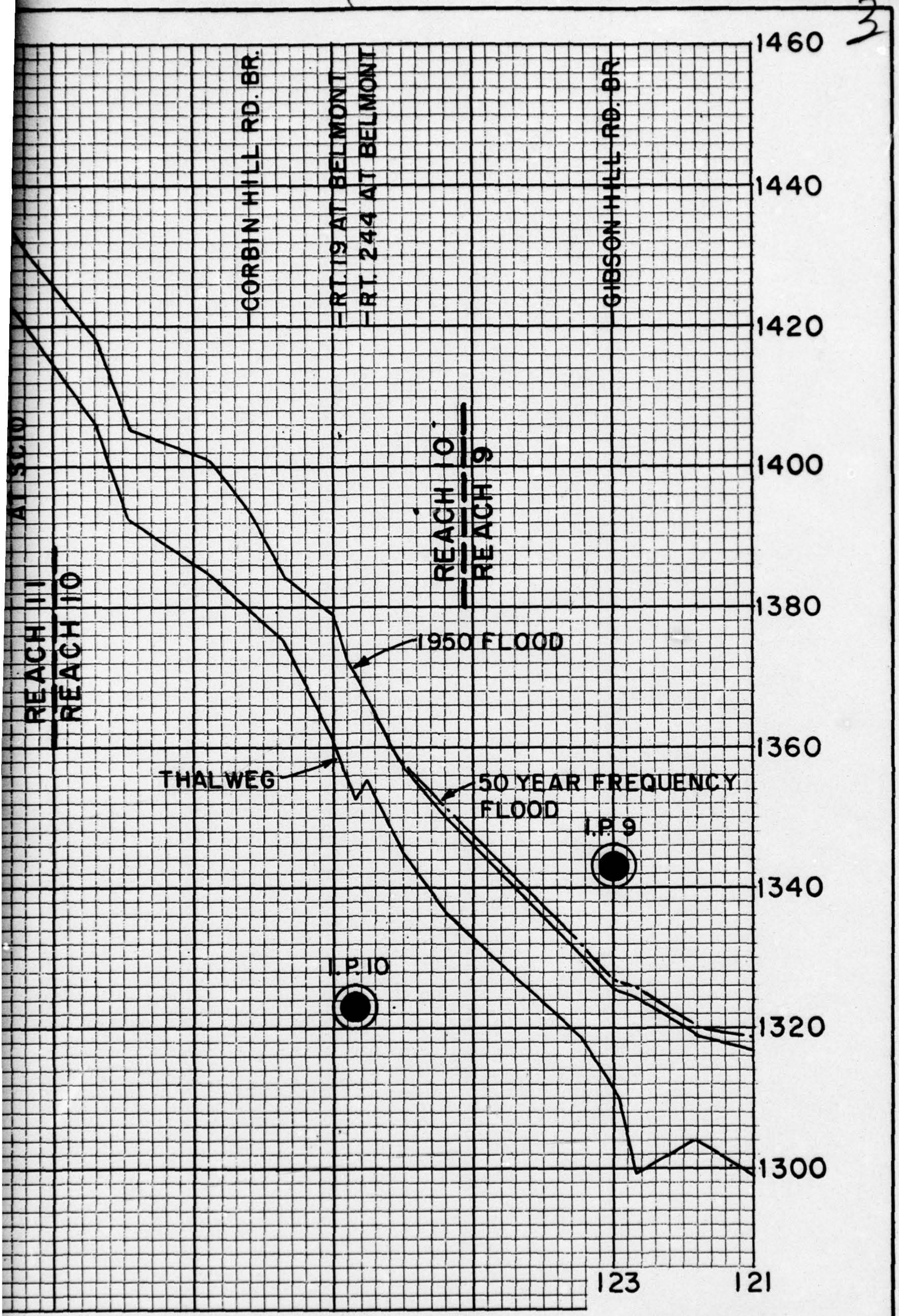


ELEVATION IN FEET U.S.G.S. DATUM
1640
1620
1600
1580
1560
1540
1520
1500
1480
1460
149
147
145
143
141
139
137
DIST
RT. 19 AT SHONGO
GRAVES RD. BR.
YORK'S CORNERS BRIDGE
HANKS BRIDGE
WEIDRICK RD. BR.
RT. 17 AT WELLSVILLE
REACH 15
REACH 14
REACH 14
REACH 13
REACH 13
REACH 12
REACH 12
REACH 11
1950 FLOOD
THALWEG
I.P. 13
I.P. 14

2-1

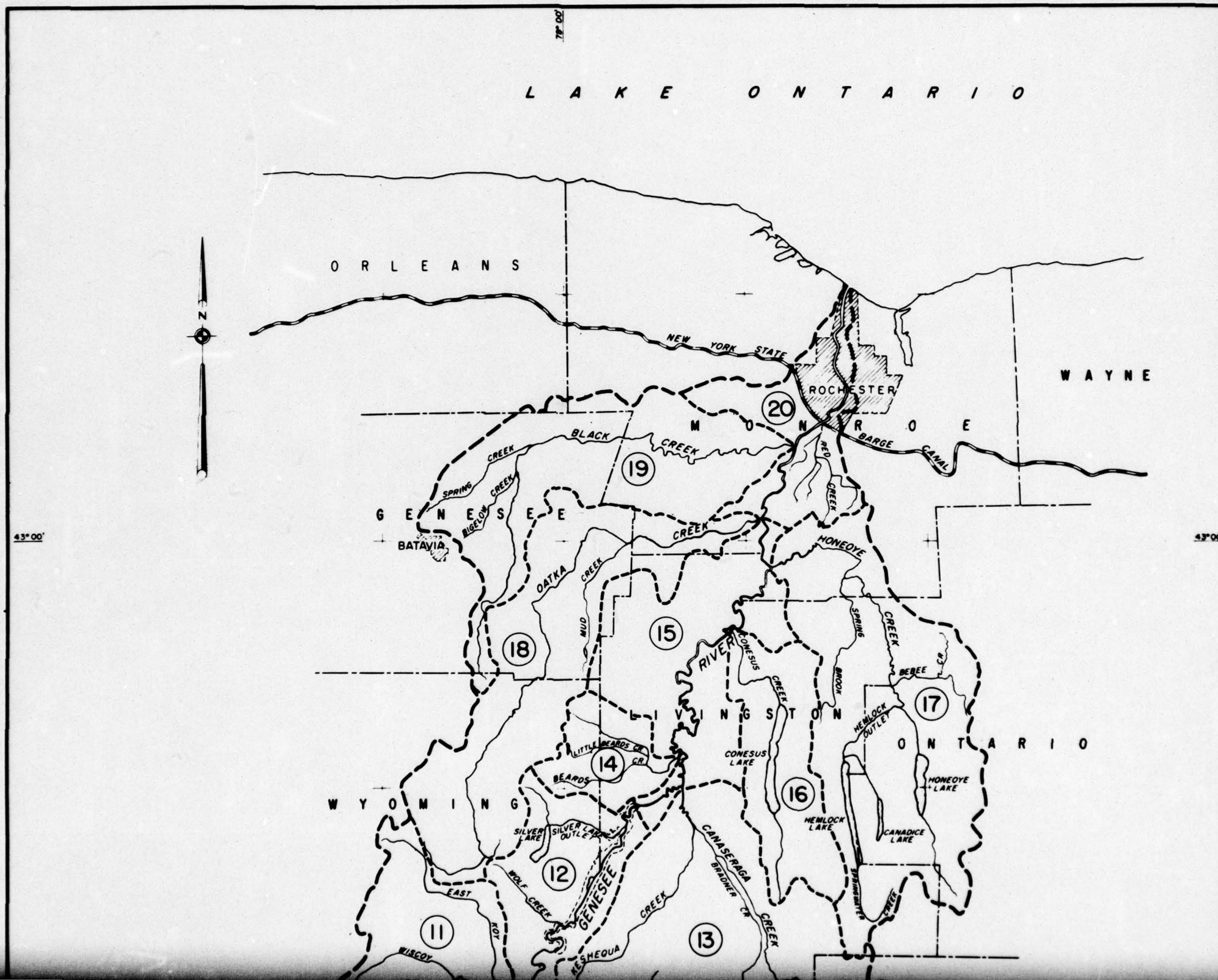


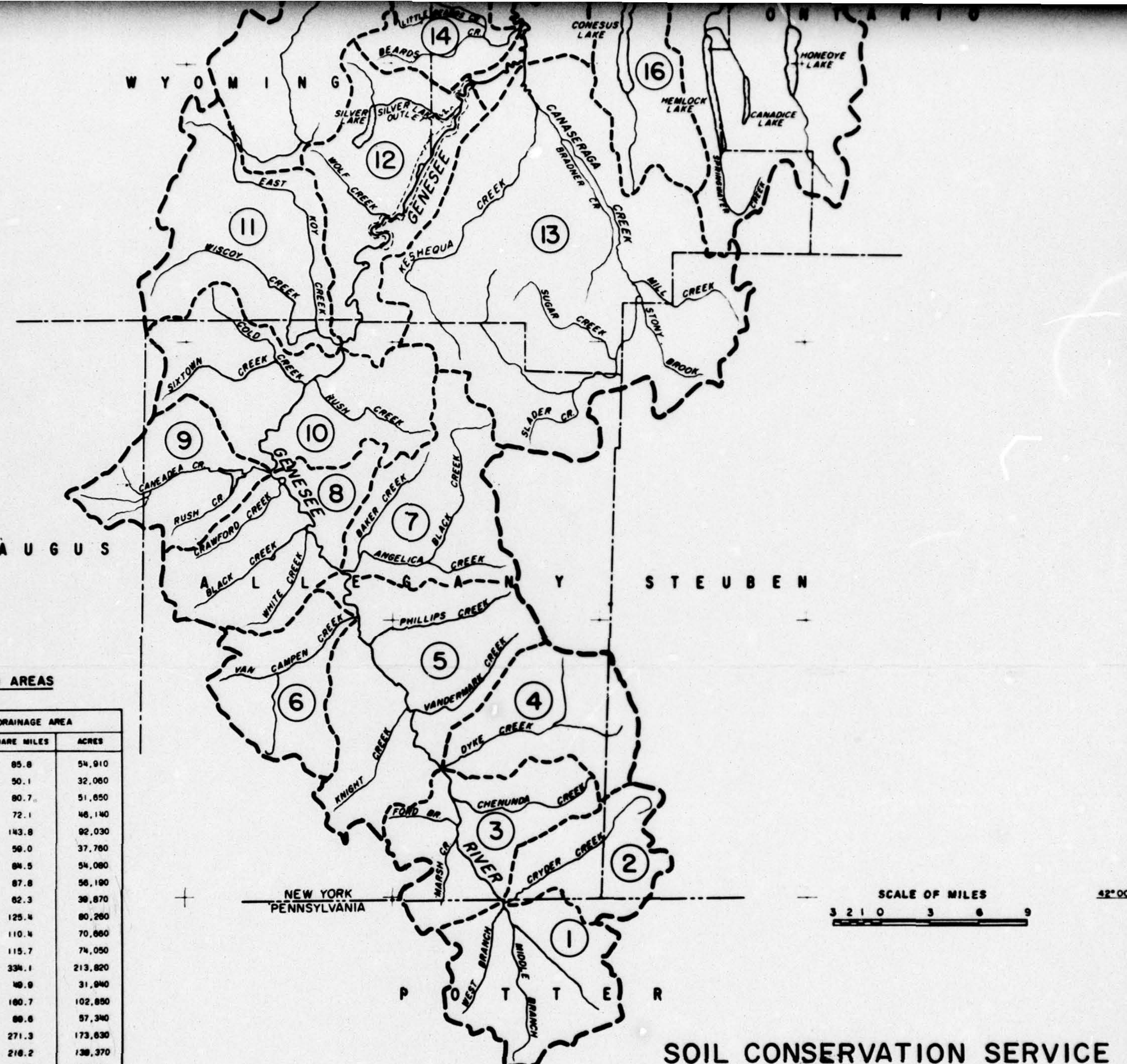
WEIDRICK RD. BR.
RT. 17 AT WELLSVILLE
REACH 13
REACH 12
REACH 12
REACH 11
OOD
I.P. 13
ELEVATION IN FEET U.S.G.S. DATUM
RIVER ST. BR. AT SCIO
REACH 11
REACH 10
CORBIN HILL RD. BR.
THALWEG
I.P. 11
1640
1620
1600
1580
1560
1540
1520
1500
1480
1460
1460
1440
1420
1400
1380
1360
1340
1320
1300
1280
139
137
135
133
135
133
131
129
DISTANCE ABOVE MOUTH IN MILES



PROFILES
GENESEE RIVER
MILE 121 TO 149

PLATE F 22


LAKE ONTARIO
ORLEANS
WAYNE
MONROE
GENESEE
LIVINGSTON
ONTARIO
WYOMING
ROCHESTER
BATAVIA
NEW YORK STATE BARGE CANAL
BLACK CREEK
SPRING CREEK
BIGELOW CREEK
OATKA CREEK
MUD CREEK
RED CREEK
HONEOYE CREEK
SPRING BROOK
BEBEE CR
HEMLOCK OUTLET
CONESUS CREEK
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
HONEOYE LAKE
SPRINGWATER CREEK
RIVER
GENESEE
LITTLE BEARDS CR
BEARDS CR
SILVER LAKE
SILVER LAKE OUTLET
WOLF CREEK
EAST KOY
WISCOY
KESHEQUA CREEK
CANASERAGA CREEK
BRADNER CR
N
43°00'
78°00'
11
12
13
14
15
16
17
18
19
20



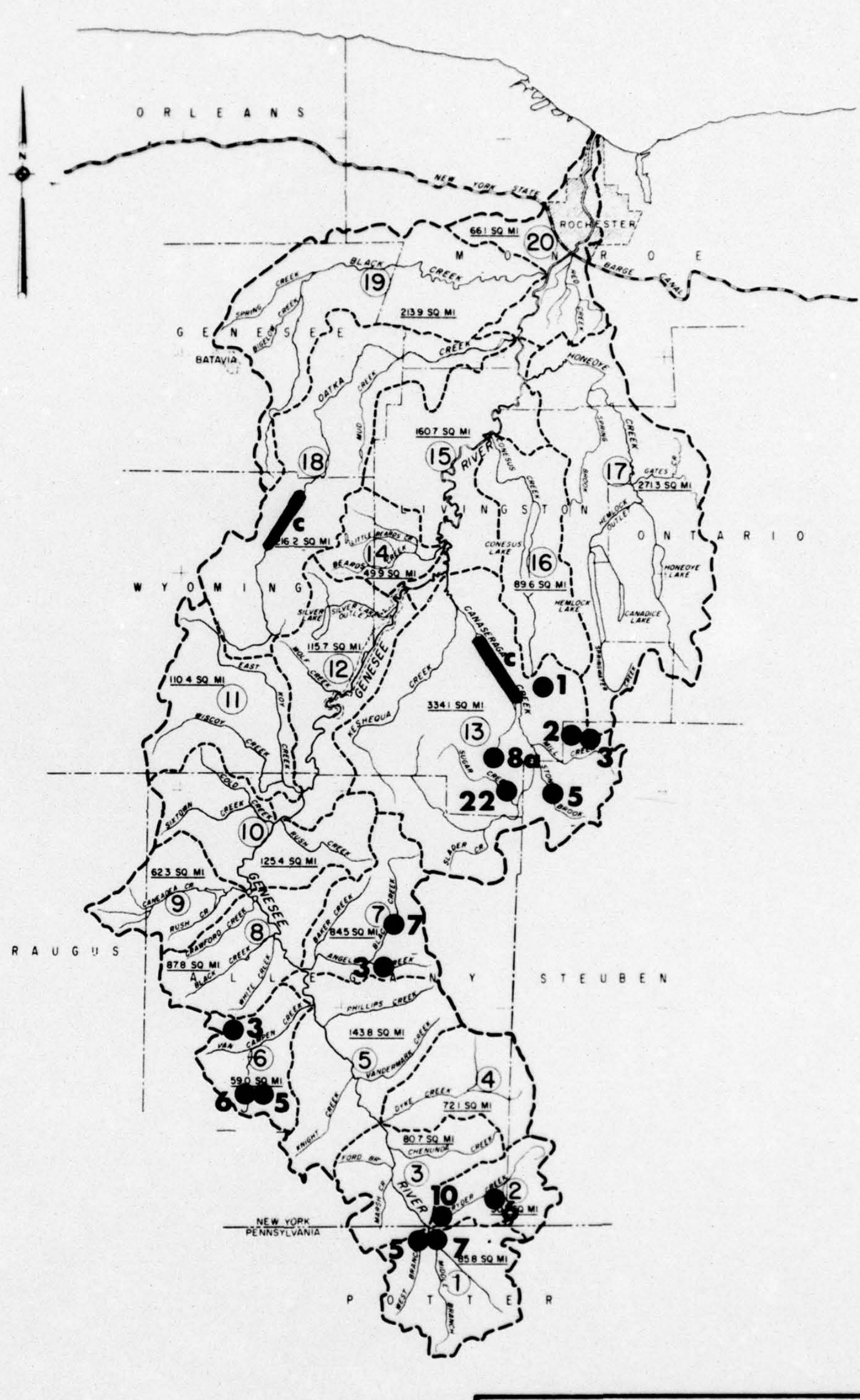
SUBWATERSHED AREAS

SUBWATERSHED		DRAINAGE AREA	
NUMBER	NAME	SQUARE MILES	ACRES
1	GENESEE - SOUTH	85.8	54,910
2	CRYDER CREEK	50.1	32,060
3	GENESEE - CHENUNDA	80.7	51,650
4	DYKE CREEK	72.1	46,140
5	GENESEE - VANDERMARK	143.8	92,030
6	VAN CAMPEN CREEK	59.0	37,760
7	ANGELICA CREEK	84.5	54,080
8	GENESEE - SOUTH BLACK	87.8	56,190
9	CANEADEA CREEK	62.3	39,870
10	GENESEE - COLD CREEK	125.4	80,260
11	WISCOY CREEK	110.4	70,660
12	SILVER LAKE OUTLET	115.7	74,050
13	CANASERAGA CREEK	334.1	213,820
14	BEARDS CREEK	49.9	31,940
15	GENESEE - GENESEO	160.7	102,850
16	CONESUS LAKE	89.6	57,340
17	HONEOYE CREEK	271.3	173,630
18	OATKA CREEK	216.2	138,370
19	BLACK CREEK	213.9	136,900
20	GENESEE - ROCHESTER	66.1	42,300
TOTAL		2,479.4	1,586,810

DATA COMPILED BY U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.

SOIL CONSERVATION SERVICE
SUBWATERSHED AREAS

PLATE F23



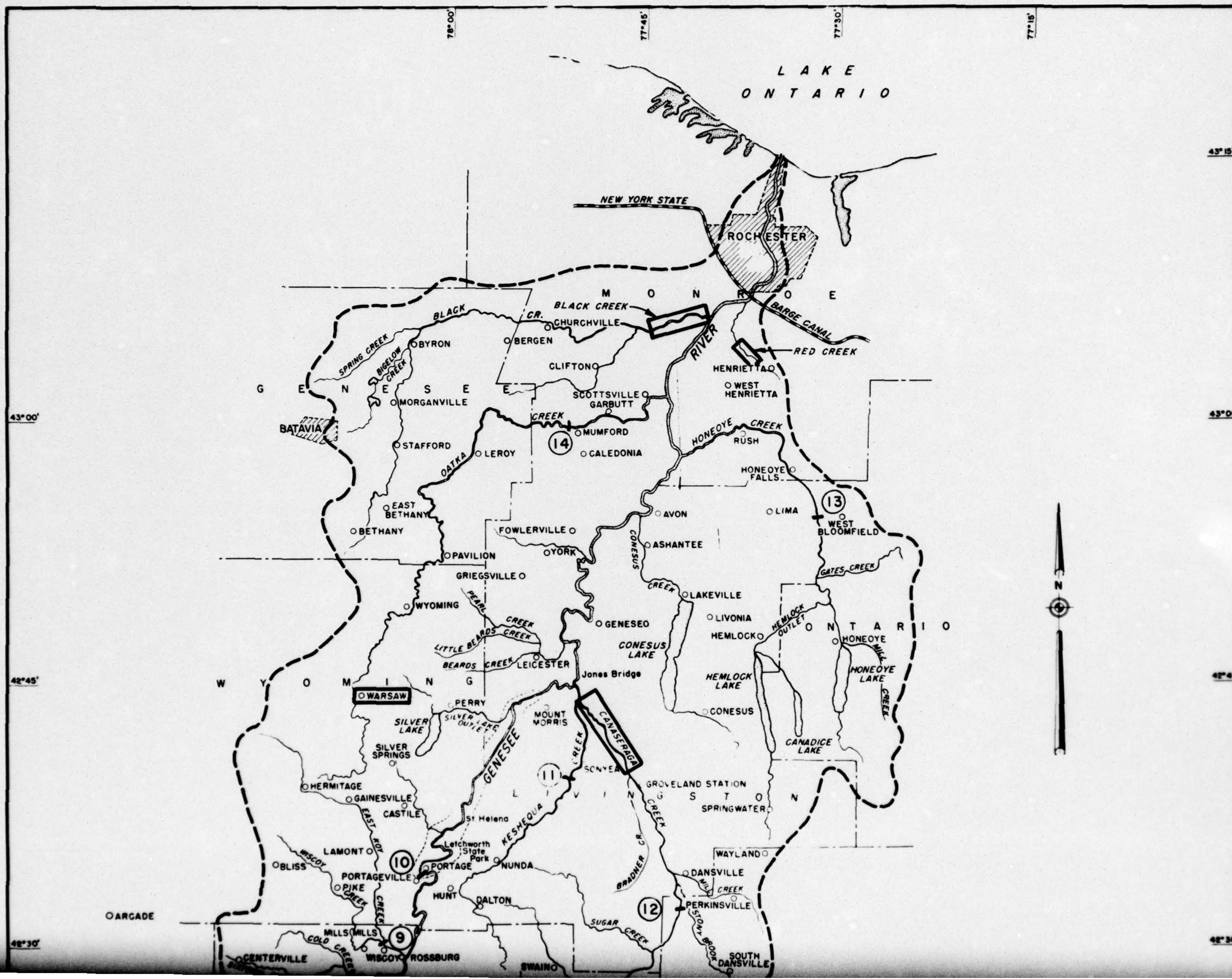
SMALL WATERSHED FLOOD CONTROL
STRUCTURES CONSIDERED BY
SOIL CONSERVATION SERVICE
FOR DETAILS SEE TABLE F9

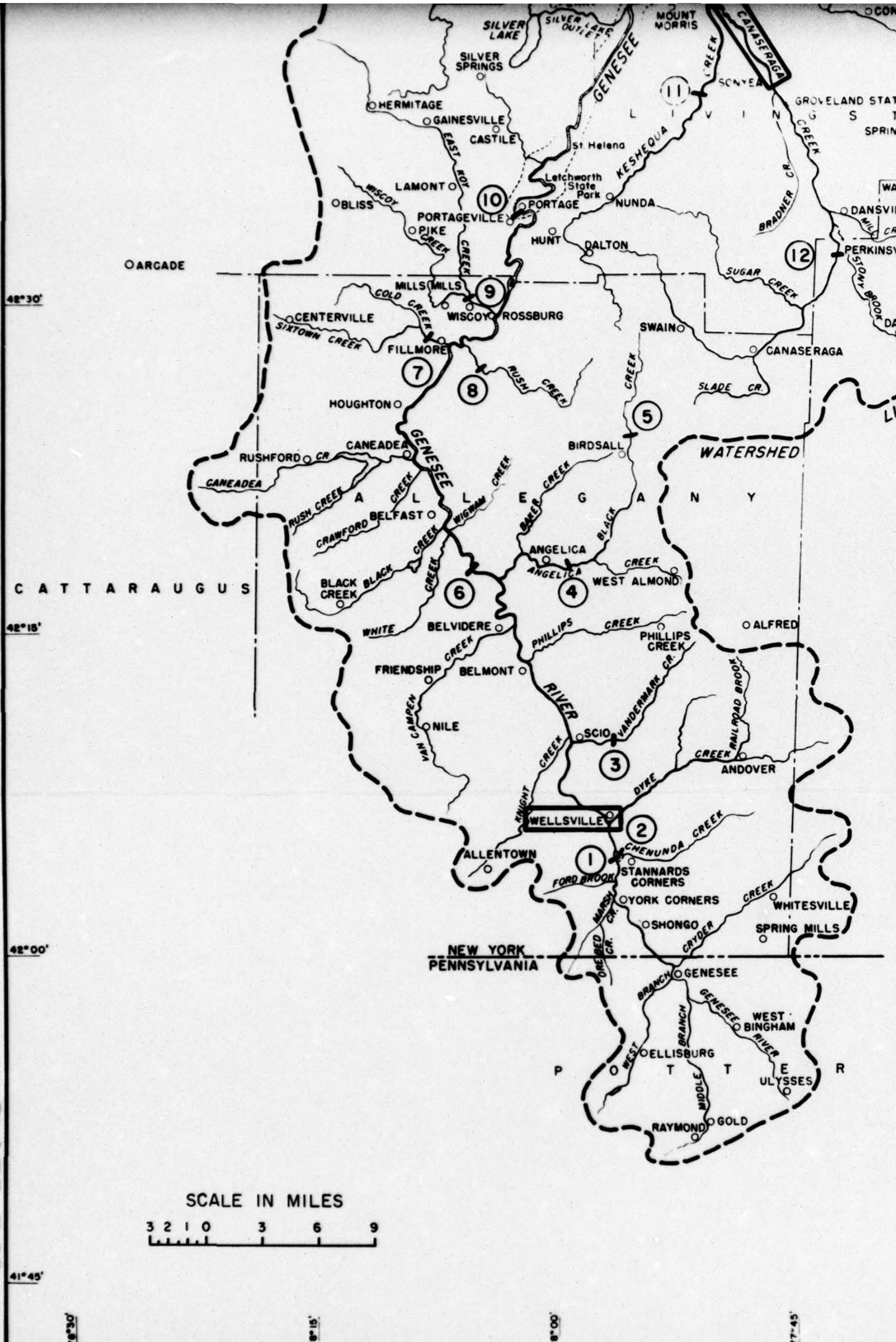
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

FLOOD CONTROL STRUCTURES CONSIDERED BY S.C.S.

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967


LAKE ONTARIO
78°00'
77°45'
77°30'
77°15'
43°15'
43°00'
42°45'
42°30'
NEW YORK STATE
ROCHESTER
MONROE
BARGE CANAL
RED CREEK
BLACK CREEK
RIVER
HENRIETTA
WEST HENRIETTA
CHURCHVILLE
BERGEN
CLIFTON
SCOTTSVILLE
GARBUTT
BYRON
SPRING CREEK
BIGELOW CREEK
GENESEE
MORGANVILLE
BATAVIA
STAFFORD
OATKA CREEK
LEROY
MUMFORD
CALEDONIA
14
HONEOYE CREEK
RUSH
HONEOYE FALLS
13
LIMA
WEST BLOOMFIELD
AVON
ASHANTEE
CONESUS CREEK
EAST BETHANY
BETHANY
FOWLERVILLE
YORK
PAVILION
GRIEGSVILLE
WYOMING
PEARL CREEK
LITTLE BEARDS CREEK
BEARDS CREEK
LEICESTER
GENESEO
CONESUS LAKE
LAKEVILLE
LIVONIA
HEMLOCK
HEMLOCK OUTLET
GATES CREEK
ONTARIO
HONEOYE
MILL CREEK
HONEOYE LAKE
HEMLOCK LAKE
CONESUS
CANADICE LAKE
Jones Bridge
WARSAW
PERRY
SILVER LAKE
SILVER LAKE OUTLET
SILVER SPRINGS
MOUNT MORRIS
CANASERAGA
CREEK
GENESEE
11
SONYEA
GROVELAND STATION
LIVINGSTON
SPRINGWATER
HERMITAGE
GAINESVILLE
CASTILE
EAST KOY
St Helena
KESHEQUA
LAMONT
10
Letchworth State Park
PORTAGE
NUNDA
BRADNER CR.
WAYLAND
DANSVILLE
BLISS
WISCOY
PORTAGEVILLE
PIKE CREEK
HUNT
DALTON
12
PERKINSVILLE
ARCADE
MILLS MILLS
9
SUGAR CREEK
STONY BROOK
COLD CREEK
CENTERVILLE
WISCOY
ROSSBURG
SWAINO
SOUTH DANSVILLE
N



INDEX TO CONSIDERED DAM SITES

NO.	SITE	STREAM	AVG. ANN. FLOOD CONTROL BENEFITS
1	STANNARD	GENESEE R.	31,260
2	CHENUNDA	CHENUNDA CR.	10,900
3	VANDERMARK	VANDERMARK CR.	990
4	ANGELICA	ANGELICA CR.	8,610
5	SUMMIT	BLACK CR.	4,250
6	BELFAST	GENESEE R.	4,370
7	COLD	COLD CR.	470
8	RUSH	RUSH CR.	650
9	WISCOY	WISCOY CR.	3,530
10	PORTAGE	GENESEE R.	0
11	TUSCARORA	KESHEQUA CR.	16,460
12	POAG'S HOLE	CANASERAGA CR.	30,390
13	HONEOYE	HONEOYE CR.	0
14	OATKA	BLACK CR.	4,350

▭ INDICATES CONSIDERED OR RECOMMENDED LOCAL FLOOD PROTECTION BY C. OF E.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

INDEX TO DAMSITES

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

PLATE F 25

PLATE F 25

GENESEE RIVER BASIN

COMPREHENSIVE

STUDY OF

WATER AND RELATED LAND RESOURCES

APPENDIX F - FLOOD CONTROL

DETAILED DAMAGE ATTACHMENT

TABLE OF CONTENTS

TABLE

FIGURES

PLATES

FLOOD CONTROL ATTACHMENT

DISCUSSION OF METHODS AND PROCEDURES

USED TO COMPUTE FLOOD DAMAGES

1A. GENERAL

This portion of the attachment has been prepared for the benefit of those persons interested in the detailed procedures used in determining the average annual damages for the flood areas throughout the Genesee River Basin. Accompanying plates of this attachment show the stage-damage curves and some of the damage-frequency curves that were used to determine the average annual damages.

2A. METHODS OF CONDUCTING DAMAGE SURVEYS BY THE CORPS OF ENGINEERS

The damage surveys conducted throughout the Genesee River Basin were similar in procedure, although the profiles from different floods were used as a reference in various localities.

3A. High water marks of known floods along the Genesee River and its tributaries were established and then hand leveled to the surrounding land and structures. In addition to actual floods, stages for hypothetical floods were derived from stage-discharge curves computed at every river section taken along the entire length of the Genesee River, and hand leveled in the same manner described above for the actual floods. In the lower Genesee Valley sections were taken across the river approximately 0.82 mile apart. Damages from hypothetical floods along the tributaries surveyed by the Corps of Engineers were estimated above and below the known flood elevations.

4A. Flood damages along the Genesee River were estimated according to the depth of water at each structure and surrounding land within the flooded outline as shown on plates F3-F15 of the main report.

5A. While establishing flood stages at each structure the first floor elevations were noted and recorded. Knowing the elevation of the first floor and the depth of water on the structure, estimates of damage were calculated from stage-damage curves of similar structures, computed by the Buffalo District from damage surveys of past floods throughout the District. Agricultural damages were computed by determining the number of acres inundated at each of several flood elevations and the estimated average value of damage per inundated acre. The damage values per acre supplied by the United States Department of Agriculture through the Soil Conservation Service are weighted values to reflect damages on an annual basis. This means damages to agricultural lands during summer,

fall, winter and spring floods were added together on a weighted basis considering the frequency of seasonal occurrences. The weighted value represents average damage from any flood during any season of the year. A complete evaluation of damages by reaches for Canaseraga Creek area can be found in Volume II, "Appendix C," Part IV.

6A. METHODS OF CONDUCTING DAMAGE SURVEYS BY THE SOIL CONSERVATION SERVICE

Due to the wide separation of flood damaged areas in the rural sub-watersheds, the differing nature of the floodwater problems and the varying intensity of the hydrologic analysis, no set procedure was followed in determining the level of average annual damages in particular areas. The magnitudes of known floods were determined from high-water marks and stage discharge computations. Areas where crop and pastures were damaged by flooding were delineated on maps. Acres damaged and land use patterns were complied by reaches. The combination of the above factors, monthly damage rates and flood-free yields were used to develop composite-acre damageable-values for each reach. Average annual crop and pasture damage was then determined by relating damageable values to frequency of inundation by depth. Where urban damages were prevalent, stage-damage relationships were developed.

7A. STAGE-DAMAGE CURVES

The estimated recurring damages in each reach for actual and hypothetical floods were plotted against the corresponding flood stage at the index point. Stage-damage curves thus developed, represented the total damages to be expected in the reach as a result of a given stage at the index point. The elevations of zero damage were estimated from data obtained during the survey. Stage-damage curves are shown on plates F1A-F6A of this attachment for the reaches along the Genesee River and Red Creek.

8A. AVERAGE ANNUAL DAMAGE

The stage-damage curve for each reach was used in conjunction with the appropriate frequency curve and stage-discharge curve in order to determine the damage-frequency relationship for that reach. The average annual damage for each reach was obtained by determining the area under each damage-frequency curve. Damage-frequency curves for reaches in the Genesee Basin are shown on plates F7A-F9A of this attachment.

GENERAL DISCUSSION OF GUIDE LINES FOR FLOOD PLAIN MANAGEMENT AND FLOOD PROOFING PRACTICES

9A. GENERAL

Regardless of the location of the flood plain or the overall plan of development for an area, the available methods of controlling future flood plain use and of flood proofing existing structures in a flood plain are generally the same. The information herein contains only general suggestions. The details of management legislation must be tailored to a plan of development for the flood plain concerned.

10A. METHODS FOR ESTABLISHING FLOOD PLAIN USE

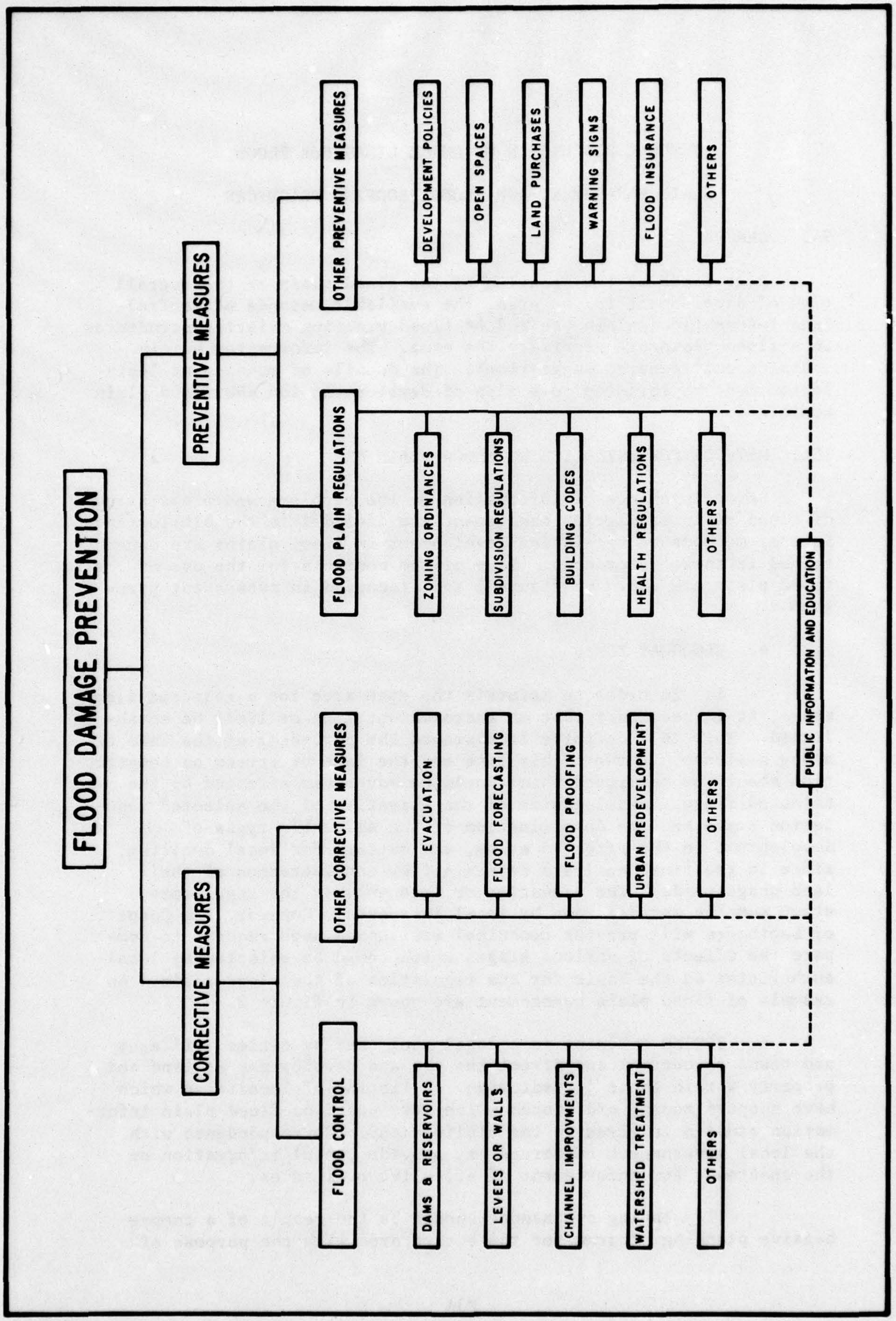
Several sources of information on the problems and preparation of flood plain regulation management are included in the bibliography. Several methods of regulating development in flood plains are contained in these references. Some of the controls for the use of the flood plain are shown on figure 1 and discussed in subsequent paragraphs.

a. FLOODWAY ZONES

1. In order to maintain the open area for a selected flood stage, it is necessary that an encroachment line or limit be established. This is a definite line around the perimeter of the lake or along a stream. Between this line and the lake or stream no construction should be permitted which would be adversely affected by the selected stage. Final choice of the elevation of the selected regulation stage and the determination of the allowable types of development in the affected areas, are matters for local decision, since in the final analysis determined by consideration of their land usage needs. The elevation or frequency of the regulatory stage must be decided upon by local interests. However, the Corps of Engineers will provide technical assistance upon request to compare the effects of various stages which could be selected by local authorities as the basis for the regulation of the flood plain. An example of flood plain management are shown in figure 2.

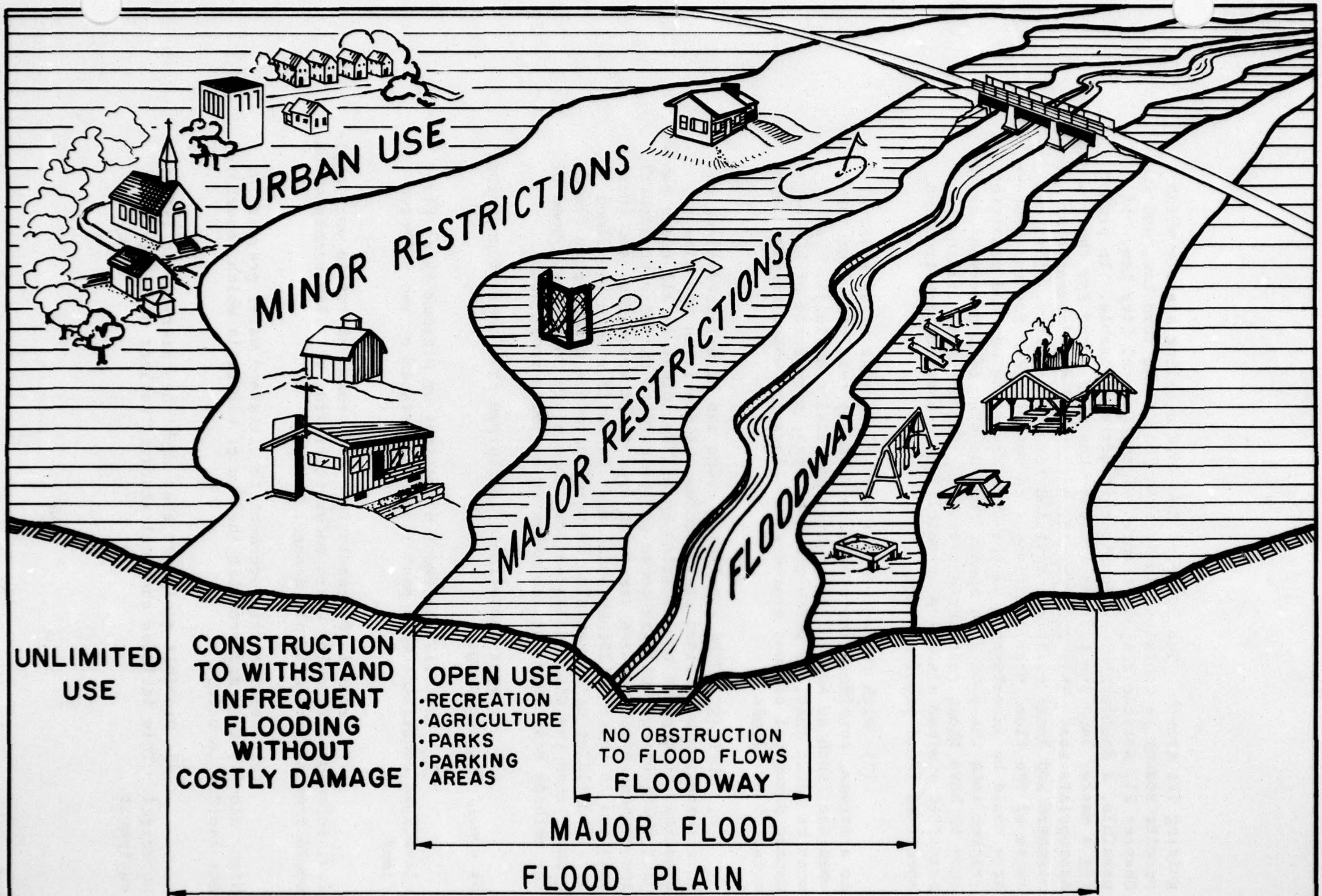
b. ZONING - Zoning is a legal tool used by cities, villages and towns to control and direct the use and development of land and property within their jurisdiction. A listing of localities which have adopted zoning ordinances which were based on flood plain information studies is given in the bibliography. Correspondence with the local governments concerned may provide useful information on the enactment and enforcement of effective ordinances.

(1) Zoning ordinances should be the result of a comprehensive planning program for the entire area with the purpose of



FLOOD DAMAGE PREVENTION
PREVENTIVE MEASURES
CORRECTIVE MEASURES
OTHER PREVENTIVE MEASURES
DEVELOPMENT POLICIES
OPEN SPACES
LAND PURCHASES
WARNING SIGNS
FLOOD INSURANCE
OTHERS
FLOOD PLAIN REGULATIONS
ZONING ORDINANCES
SUBDIVISION REGULATIONS
BUILDING CODES
HEALTH REGULATIONS
OTHERS
OTHER CORRECTIVE MEASURES
EVACUATION
FLOOD FORECASTING
FLOOD PROOFING
URBAN REDEVELOPMENT
OTHERS
FLOOD CONTROL
DAMS & RESERVOIRS
LEVEES OR WALLS
CHANNEL IMPROVMENTS
WATERSHED TREATMENT
OTHERS
PUBLIC INFORMATION AND EDUCATION

FIGURE 1



EXAMPLE OF FLOOD PLAIN MANAGEMENT

F5A

FIGURE 2

guiding its growth. The State of New York enabling statute which permits zoning is contained in Section 263 of the Town Law, and in Chapter 21, Article 2-A, Section 24 of the General City Law. If possible, a double zoning technique is often desirable. In preparing a master land use plan, all areas should be zoned for their most appropriate use. This would be the pattern of development that planners and local officials envision for the locality. Then, because of the flood problem, flood zone restrictions for the appropriate area could be superimposed on the regular zoning map and provisions written into the ordinance specifying the kind of improvement necessary to have these restrictions removed: for example, filling to a specified minimum elevation, prohibition of basement construction, specified flood proofing, etc.

(2) With respect to the high flood risk areas adjacent to a stream, consideration should be given to retaining land for open use, such as agriculture, parks and athletic fields. Care must be taken that, as parks are developed, structures of higher damage potential are not placed at an elevation where they will be affected by floods.

c. BUILDING CODES - Building codes can be utilized alone or in combination with flood plain zoning. Since it is not always practical to prevent the location of all buildings in all areas subject to flooding, building codes can be used to minimize structural and consequential damages resulting from flood velocities and inundation to those buildings which must be built within the flood area. Building codes can also be used to reduce damage from floods greater than the flood selected for flood plain reference. Some of the methods adaptable for inclusion in building codes are:

(1) Prevent flotation of buildings from their foundations by specifying anchorage.

(2) Establish basement elevations or minimum first floor elevations consistent with past flood occurrences or the selected flood.

(3) Prohibit basements in those areas subject to very shallow, infrequent flooding where moderate filling and slab construction would prevent virtually all damage.

(4) Require reinforcement to withstand water pressure or high velocity flow and prohibit the use of materials which deteriorate rapidly in water.

(5) Prohibit equipment that might be hazardous to life if submerged. This includes chemical storage, boilers or electrical equipment.

d. SUBDIVISION REGULATIONS - Subdivision regulations can often serve as a supplement to zoning. Regulations may specify the lot size, elevation of land, degree of freedom from flooding and other points pertinent to the welfare of the community. Areas which may be attractive for building subdivision development during dry weather may be subject to inundation during high stages.

e. OTHER CONTROLS - The following approaches to flood plain regulation may be adaptable to special situations or may serve as supplemental measures to an overall regulation program.

(1) Building financing - Very little building is carried on without financing. Government and private financing institutions can control development of the flood plain by denying mortgage guarantees or funds to subdivision or individual builders who wish to build in the flood plain area.

(2) Public purchase - Outright public land purchase of the flood plain is another method of preventing flood plain development. This method is most effective when made part of a recreation or park plan for the area.

(3) Flood insurance - Flood insurance at the present time is practically nonexistent. However, its use in the future with rates accurately indicating flood potential, could serve as a substantial aid in regulating flood plain development.

(4) Warning signs - An inexpensive method which may be used to discourage development is the erection of flood warning signs in the flood plain area or the prominent posting or previous high water levels. These signs carry no enforcement but simply serve to inform prospective buyers that a flood hazard exists. Several signs or stage boards erected on public property at several locations within the town showing the levels of a past flood and the 100-year flood would provide a convenient reference and keep residents aware of the flood possibilities.

11A. REDUCTION OF FLOOD LOSSES BY FLOOD PROOFING

Those who are already residing in the flood plain and are subject to flood damage may be particularly interested in the methods of flood proofing the affected structures in order to reduce the possible damage. A recommended reference is "Flood Proofing: An Element in the Flood Damage Reduction Program," by John R. Shaeffer. Some of the possible flood proofing measures are listed below. The first three methods are particularly applicable to residences or businesses which normally suffer only basement flooding. In the underdeveloped areas, some of the methods may be incorporated into building codes, zoning or subdivision regulations in order that structures permitted in the restrictive zones can be better protected for floods greater than the selected reference flood.

Figure 3 illustrates some of these flood proofing methods.

a. SEEPAGE CONTROL - This method involves the use of asphalt or quick set hydraulic compounds to seal walls which are subjected to water pressure. This approach is often complemented with sump pits and pumping.

b. PREVENTION OF SEWER BACKUP - In many areas, not subject to direct overflow, considerable damage occurs from backup of sanitary or combined sewers that are overloaded by high storm water runoff, flooded manholes or high tailwater at the sewer outlets. Various types of automatic and manually operated valves and checks can be installed on house sewers as well as on lateral and trunk sewers to prevent flooding from sewer backup. In the absence of these measures a section of pipe screwed in place over basement drains is a cheap, effective means of coping with this problem. It allows water to rise up in the pipe but prevents overflow up to the limit of the length of pipe. It is recommended that, whenever possible, the storm and sanitary sewers be separate systems to prevent backup through a combined system into residences from overloaded storm sewers.

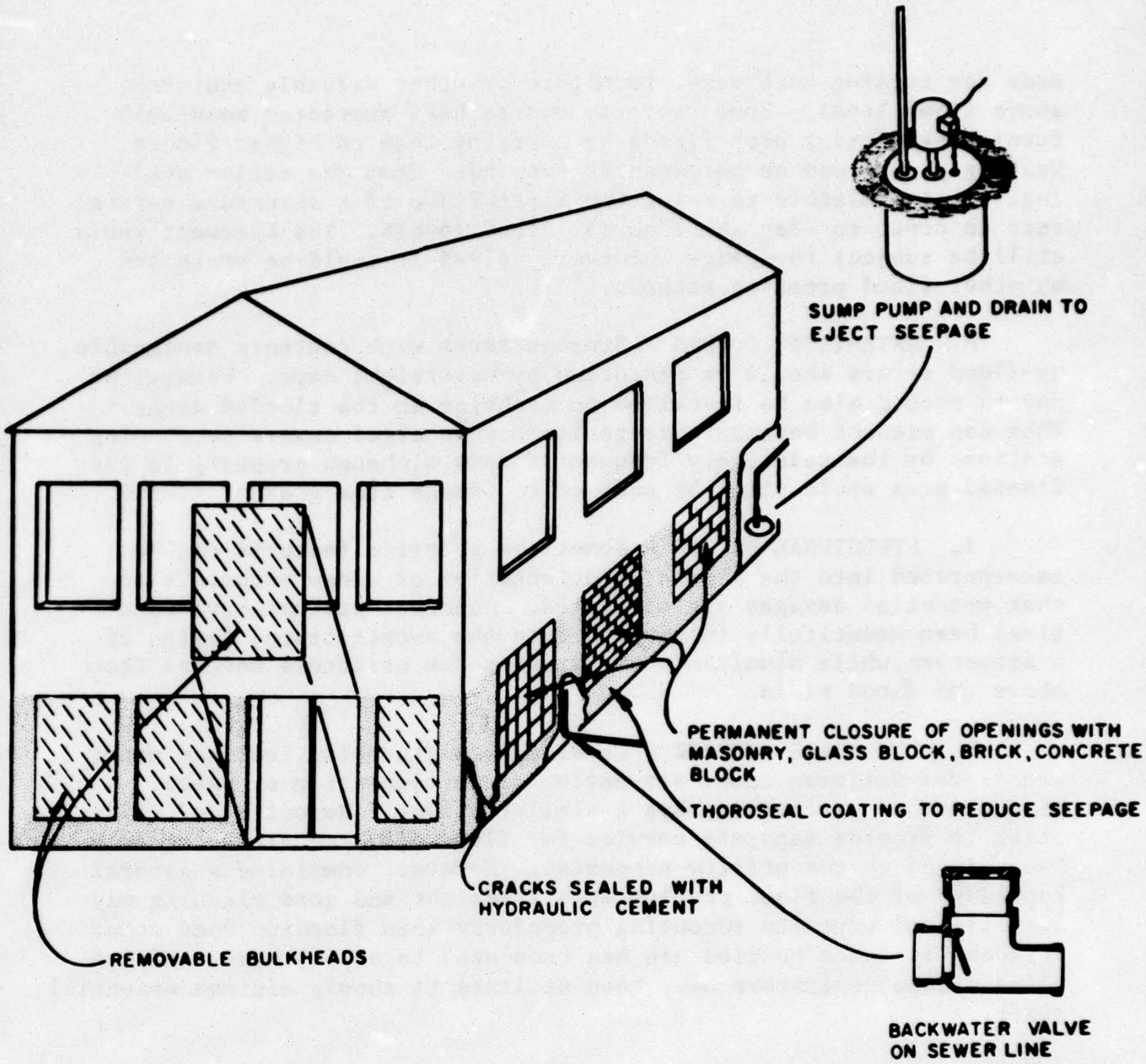
c. PERMANENT CLOSURE - In a relatively watertight structure, unnecessary openings may be permanently sealed. If the passage of light is desirable, glass brick or other translucent material having adequate structural strength, should be considered.

d. PROTECTED OPENINGS - Sandbagging of doorways and other necessary openings in structures has been used as a temporary emergency protection for many years. Removable bulkheads or flood gates are often a more efficient means of accomplishing the same purpose. These devices can be bolted against a frame containing a neoprene gasket which provides a watertight seal.

e. PROTECTIVE COVERINGS - The rapid development of new types of plastics with various specific properties should be considered in connection with sealing and protecting machines and mechanical equipment from silt and rust damage.

f. FIRE PROTECTION - The possibility of fire from electrical short circuiting is a potential hazard during flooding. Power shut-off on a large scale is generally not practical because it usually would affect areas outside the flooded zone. Attention to fuse protection for individual structures could reduce the possibility of fire when power is not disrupted.

g. ELEVATION - The regulation of the minimum elevation above which future structures must be built has been discussed previously in connection with zoning and subdivision regulations. However, for existing structures in flood risk areas, provisions can be



FLOOD-PROOFED STRUCTURE

NOTE:
THIS PLATE REPRODUCED WITH CHANGES FROM "FLOOD PROOFING AN ELEMENT IN A FLOOD REDUCTION PROGRAM", BY JOHN R. SHAEFFER.

METHODS OF FLOOD PROOFING A STRUCTURE

FIGURE 3

made for raising machinery, furniture or other valuable equipment above flood level. Some property owners have protected household furnishings during past floods by carrying them to higher floors. Heating plants can be permanently suspended from the cellar ceiling. It is possible to raise the first floor of a structure several feet in order to stay above normal flood levels. The basement would still be subject to damage, however, unless it could be protected by other flood proofing methods.

h. WATERTIGHT COVERS - Storage tanks with contents damageable by flood waters should be protected by watertight caps. Watertight covers should also be installed on manholes in the flooded areas. This can prevent basement damage from overcharged sewers or pumping stations by the relatively frequent floods although property in the flooded area would still be subject to damage from greater floods.

i. STRUCTURAL DESIGN - Sometimes specific features can be incorporated into the design or orientation of a new structure so that potential damages are minimized. Concrete pilings have sometimes been beautifully integrated into the architectural design of a structure,while simultaneously raising the structure several feet above the flood plain.

j. UTILITIES SERVICE - Considerable financial loss can occur when power failures cause disruption of refrigeration or heat. Disruption of gas service has a similar effect. Rerouting of utilities to provide separate service for flood affected areas can only be achieved by the utility companies. However, combining a general knowledge of the flood problem with foresight and good planning may simplify and expedite rerouting procedures when flooding does occur. In specific cases bottled gas has been used to supply heat, and gasoline driven generators have been utilized to supply minimum essential power.

12A. BIBLIOGRAPHY

Development of Flood Plain Regulations

(*) (**) 1. Task Force on Flood Plain Regulations. A Guide for the Development of Flood Plain Regulations. ASCE Journal of the Hydraulics Division, Vol. 88, No. HY 5, Proc. Paper 3264, September 1962, pp. 73-119

(*) 2. Murphy, Francis C., Regulating Flood Plain Development, Chicago: University of Chicago, Department of Geography, Research Paper No. 56, 1958

3. Department of Commerce, State of New York, Local Planning and Zoning, 1965

4. Northeastern Resources Committee, Papers Presented on Flood Plain Zoning

5. Connecticut Comm. Development Division, Flood Plain Regulation (A Planning Aid)

6. General MacDonnell (Western Water News), Flood Plain Zoning

7. Howe, J. W., Modern Flood-Plain Zoning Ordinance Adopted by Iowa City, Civil Engineering, April 1963

8. Zoning Regulations for Knoxville, Tennessee (Excerpts)

9. Zoning Ordinance, City of Murray, Kentucky

10. Subdivision Regulations, City of Murray, Kentucky

11. Othie R. McMurry, Iowa-Code Chapter 455A, amended by 61st General Assembly of Iowa. (January-June 1965): Iowa Natural Resources Council, State House, Des Moines, Iowa 50319

12. Sterling Township Board, Comprehensive Zoning Ordinance adopted 26 October 1965 (referenced to flood plain information report): Macomb County, Michigan

13. City of Farmington, Zoning Ordinance C-193-65 approved May 1965 (utilized 1963 flood plain information report): Oakland County, Michigan

14. City of Detroit, Ordinance No. 784-F, Chapter No. 266 passed April 1963: Michigan

15. "Regulating Flood Plain Development" by Francis C. Murphy published in 1958 by the Department of Geography of the University of Chicago

16. Zoning for small Towns andRural Counties published by the U. S. Department of Commerce, Economic Development Administration, Washington, D. C. June 1966

Further information on papers 4-10 can be obtained from the Tennessee Valley Authority, Knoxville, Tennessee 37902

* Contains detailed reading bibliography
** Contains flood plain regulations or extracts

Planning References

1. Tennessee Valley Authority, Technical Library, Flood Damage Prevention, An Indexed Bibliography, May 1966

(*) 2. Miller, Harold V., Flood Damage Prevention for Tennessee, Nashville, Tennessee State Planning Commission, Publication 309, November 1960

(*) 3. White, Gilbert F., et al., Papers on Flood Problems, University of Chicago, Department of Geography. Research Paper No. 70, Chicago, 1961

4. Goddard James E., Flood Damage Prevention and Flood Plain Management Improve Man's Environment, ASCE Environmental Engineering Conference, Atlanta, Georgia, February 1963

5. Sutton, Walter G., Planning for Optimum Economic Use of the Flood Plain, ASCE Environmental Engineering Conference, Atlanta, Georgia, February 1963

6. Sutton, Walter G. and Weber, Eugene W., Environmental Effects of Flood Plain Regulations, ASCE Environmental Engineering Conference, Salt Lake City, Utah, May 1964

7. Moore, Planning for Flood Damage Prevention

8. Siler, Flood Problems and Their Solution Through Urban Planning Programs

9. Plan for Flood Damage Prevention at Bristol, Tennessee-Virginia

10. "An Economic Approach to Coping with Flood Damage." John V. Krutilla, Resources for the Future, June 1966

11. "Flood Plain Management in the Green River Flood Project," William B. Gillespie, August 1966

Further information on papers 7-9 can be obtained from the TVA.

Flood Proofing References

(*) 1. Shaeffer, John R., Flood Proofing: An Approach to Flood Damage Reduction, Chicago: University of Chicago, Department of Geography, Research Paper No. 65, 1960

2. Goddard, James E., Flood Proofing and Flood Damage Prevention

* Contains detailed reading bibliography

Technical

1. U. S. Geological Survey Water-Supply Paper 1526 "Hydraulic and Hydrologic Aspects of Flood-Plain Planning" 1961

2. U. S. Department of Commerce, Weather Bureau Technical Paper No. 40 "Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 years." May 1961

3. Corps of Engineers, Sacramento District, Sacramento, California "Statistical Methods in Hydrology" January 1962

4. Corps of Engineers, U. S. Army Engineering and Design Manual EM 1110-2-1409 "Backwater Curves in River Channels" December 1959

5. Department of the Army, TB 5-550-3, Flood Protection Techniques, February 1957

The above papers can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20425

Movies

1. "Water: Pattern of Life" from Ohio Water Commission, 1104 Ohio Departments Bldg., Columbus, Ohio 43215

2. "What Can We Do About Floods" from Bureau of Audio Visual Instruction, University of Wisconsin, 1312 West Johnson Street, Madison 6, Wisconsin

DISCUSSION OF FLOOD WARNING AND FORECASTING SERVICE (1)

13A. GENERAL

In any comprehensive study of the distribution, use and control of streamflow, science and technology play an important part not only in structural planning but also in fields apart from and combined

(1) This section prepared by ESSA, Weather Bureau

with structures. Thus, the effects of weather on streamflow are important factors in day-to-day water management in a river basin. In essence, a new dimension is added. Through hydrology and climatology, a generalized, long-term picture is obtained regarding average and extreme conditions. Through river forecast techniques, on the other hand, the rather unreal "average" situation can be replaced by the actual one plus a valuable estimate of the trend for the near future and, through extended-range weather and river forecasts, the nature of the relationship of the current situation to "average" for a long period can be obtained.

14A. WATER USE MANAGEMENT AND RESERVOIR CONTROL

Where storage and distribution of water within a basin can increase its usefulness, the process can usually be made more efficient when gains through precipitation can be balanced against losses through planned use. Some scheduling can often be done on the basis of the current and longer-range weather and river forecasts that will work toward the least discharge of stored water over and above that which can satisfy needs downstream.

15A. MULTI-PURPOSE STRUCTURES FOR WATER USE

Reservoirs for multi-purpose use are usually maintained at a determined level and therefore gains in inflow due to expected runoff can be anticipated through early drawdown for power production, transfer to a lower reservoir, or through making additional water available for irrigation, low-flow augmentation, or similar needs. If power production is a part of the program, one or more cycles in a pumping program for a pumped-storage complex might be omitted, with the needed water obtained from storm runoff or snowmelt. The same principles could be applied to storage and distribution during dry periods. Water users could be advised of the necessity of adopting a reduced water-use schedule due to the expectation of continued dry weather. Combining hydrology and meteorology, the river forecaster would be able to predict, in view of expected weather, when runoff might again resume following a dry spell, incorporating a soil-moisture index indicator into the prediction.

16A. STRUCTURES FOR FLOOD PROTECTION

Flood-protection works when regulated normally discharge excess inflow at the first opportunity. However, other factors, depending on the circumstances, do also enter the picture. In the Genesee Valley, for instance, the spring runoff period usually comes at a time of saturated and/or frozen soil and when storm systems remain active in the Great Lakes area. Also, even during fair periods rapid temperature changes can provide additional and

important runoff amounts through snowmelt. Thus, the condition of downstream tributaries becomes an important and generally overriding factor in determining the timing and amount of reservoir release. This, in turn, depends on forecasting weather and streamflow in the lower tributaries well in advance of the timing of optimal reservoir release, since time-of-travel must enter the picture.

17A. Under extreme conditions, when a series of massive runoff events might threaten a spillway-overflow situation in regulated reservoirs, the scheduling of release programs to minimize damage would require the closest coordination between the responsible authority and the river forecaster.

18A. FLOOD DAMAGE REDUCTION AND RIVER FORECASTING

Flood protection by engineering works has been the most widely used means of reducing flood losses. In the Genesee Valley, this has taken the form of flood walls, Mt. Morris dam and reservoir, and channel improvements at a number of places. Here again, however, such can be accomplished in reducing loss of life or property through the best and most prompt uses of flood adviseries and warnings. The results in terms of effectiveness depend on the lead time of the forecast, the thoroughness of its dissemination, the alertness of the basin residents in making provision for receiving the warnings, and the promptness and thoroughness practiced in putting practical and economic flood proofing measures into effect.

19A. Flood proofing measures are commonly undertaken by commercial interests on receipt of warnings and in view of the amount of water expected. In residential areas, some idea of the importance of this action in flood preparedness can be seen in the figures of Table 1.

20A. Sheaffer[1] presents a summary of procedures that can be undertaken in a variety of locations in the flood plain or surrounding flooded areas, and those initiated on receipt of warnings are enumerated below:

a. Reverse flow in basement drains or sewer lines is a common cause of flood damage. Manually-operated valves would be closed with the imminence of flooding. In some instances, temporary extensions can be screwed into the floor drain, thus extending it above flood level.

b. Structures are sometimes of such a nature that they will withstand the entry of water, provided openings are protected. Doorway protection can be by a sandbag barrier, or perhaps a temporary brick wall, if time permits. A wooden bulkhead with sealing material can be installed.

TABLE 1

POSSIBLE REDUCTION IN DAMAGE FROM MAXIMUM

UTILIZATION OF FLOOD WARNING FORECASTS

IN RESIDENTIAL AREAS ALONG GENESEE RIVER

Depth of Flooding in Feet	Possible Percent of Damage Reduction	
	Good Units	Fair Units
0-3 (Cellar)	33	22
3-6	24	15
0-1 (First Floor)	32	24
1-3	37	34
3-6	38	35

These reductions have been estimated by assuming the residential owners had 12 to 24 hours notice of flooding. It was also assumed that they would do everything possible to prevent damage and had an area to which they could move the moveable items. Commercial and public units have generally been found to use all flood fighting measures that are economically possible with the amount of flood warning that they now receive.

c. The advent of plastic films makes possible extensive flood proofing even though the item being protected is of such a nature that removal to higher floors is impossible or not economically feasible. Such items can often be completely surrounded by plastic sheeting, preventing irreparable damage from silt as well as water. Even if lower layers of material cannot be protected, plastic film can be inserted above water level, preventing the upward movement of moisture due to capillary action from one layer to the ones above.

d. Such a simple act as that of merely disconnecting the power circuits serving equipment possibly subject to flooding has been found to reduce by half the restoration costs when flooding actually occurred. With a disconnected appliance, only cleaning and drying may be required, whereas the short-circut resulting from power applied adds to the cost since electrical repair is included.

e. Removing and relocating equipment and furniture can often be accomplished even in a small house with quite limited storage space. One ingenious protection measure used successfully was to suspend home furniture and furnishings from the ceiling, with flood waters entering below without damage to the removed materials. Ceiling repairs were far less costly than would have been the loss of furnishings.

These and many other measures have been taken following receipt of flood advisories and warnings. Prior action with ingenuity can always reduce flood losses, and in some cases prevent any loss at all.

21A. THE PRESENT RIVER FORECAST PROGRAM

In 1954, a network of river and rainfall gaging stations was organized in the Genesee basin. Most of the rainfall stations were newly established at that time, supplemented by climatological stations previously established by the Weather Bureau. In most cases, existing stream gaging stations of the U. S. Geological Survey were utilized, through a joint-use arrangement with that agency. This network, consisting of 23 stations, made available the minimum in measurements needed to estimate runoff from rainfall and/or snowmelt. It is funded through the Corps of Engineers and was installed and is maintained and operated by ESSA - Weather Bureau. The locations of the stations are shown in plate E3, in the area within the Genesee Valley.

22A. With the establishment of the gaging network, a river and flood forecasting system was developed by the Hydrologic Services Division of the Weather Bureau and put into use by the personnel of the Rochester Weather Bureau Office. At the same time, a system for dissemination of forecast information was developed, through the cooperation of commercial radio and television news departments,

city-county radio networks, Civil Defense communications facilities, fire bureau networks, and newspapers.

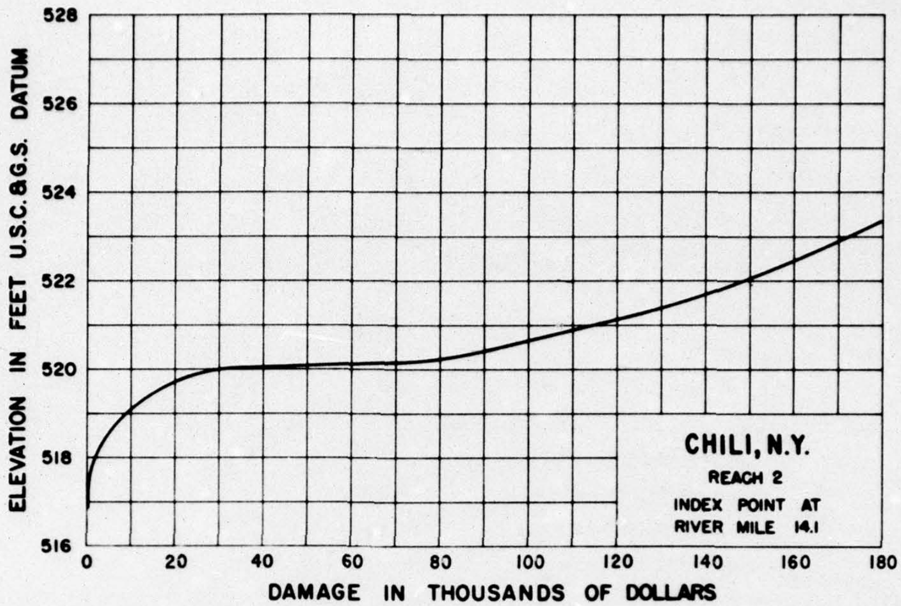
23A. Daily reports of morning river stage, and precipitation during the past 24 hours, are received at points in the upper, central and lower portions of the valley. In addition, arrangements are in effect for substation observers at the gaging stations to report significant amounts of precipitation and/or important rises in river level at the time of the morning observation. On the basis of this information, daily forecasts of expected river conditions are made and disseminated to local news media. During flood conditions, special bulletins are issued as conditions warrant.

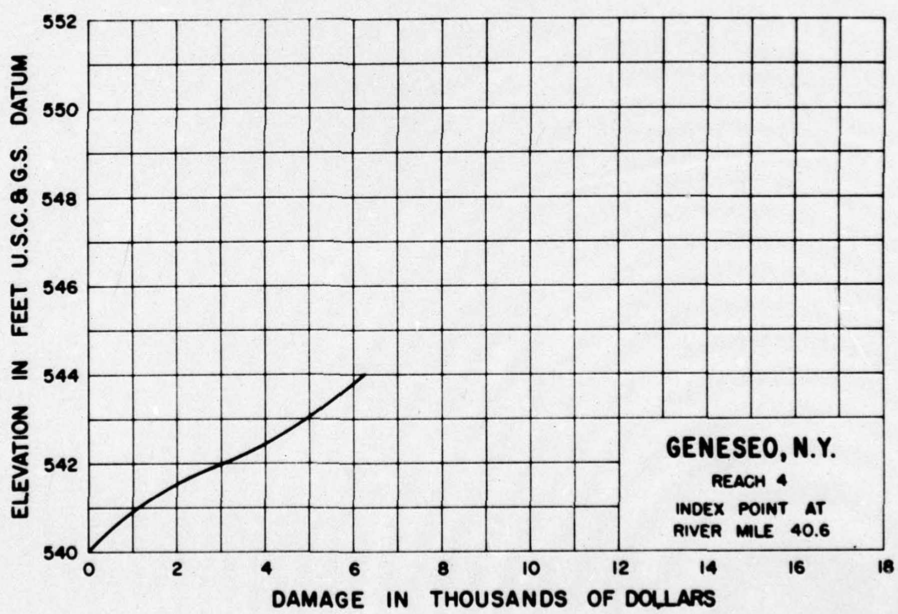
24A. Warnings disseminated through the means indicated above are then put to use by local protection agencies, and by individuals directly on receipt of the information through news media.

25A. FUTURE NEEDS

A more efficient use of water within the Genesee Basin would also require provisions for an expanded hydrologic forecasting system, since more emphasis would be put on day-to-day reservoir and river levels, in place of the present generalized estimates with major attention to flood situations. Additional telemetered gages, both river and rainfall, would be used, with the resulting information processed with more efficiency and in much greater detail through the use of computer-oriented programs. Such information would be the necessary basis for structure regulation and for anticipating water needs throughout the basin.

1. Sheaffer, John R.: Flood Proofing: An Element in a Flood Damage Reduction Program. University of Chicago Dept. of Geography Research Paper #65, 1960.





NOTES:

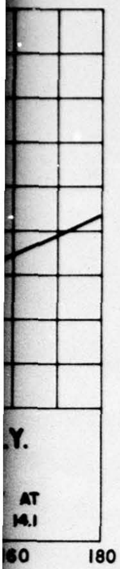
ALL VALUES ARE ON THE AUGUST 1964 PRICE LEVEL AND DEVELOPMENT.

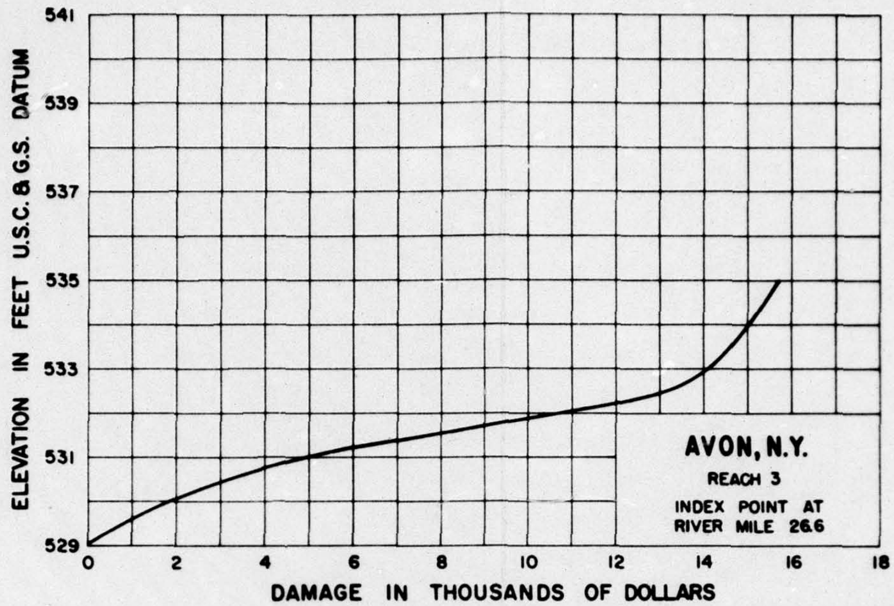
REACH I IS WITHIN THE CITY OF ROCHESTER AND HAS NO SIGNIFICANT DAMAGE.

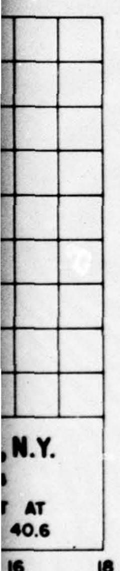
REACH 5 IS LOCATED WITHIN LETCHWORTH STATE PARK AND HAS NO SIGNIFICANT VALUE.

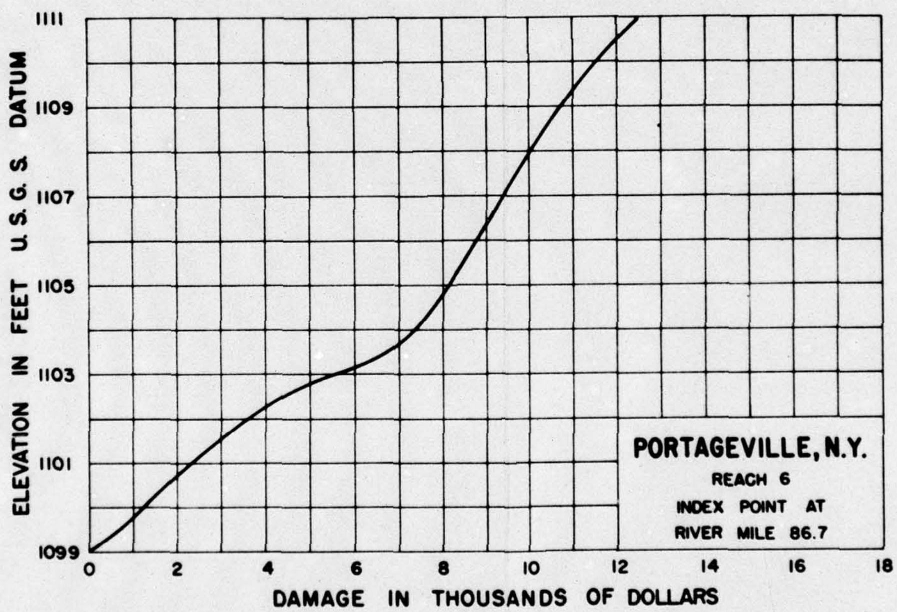
CURVES DO NOT EXCEED THE 100 YEAR FLOOD STAGE.

2









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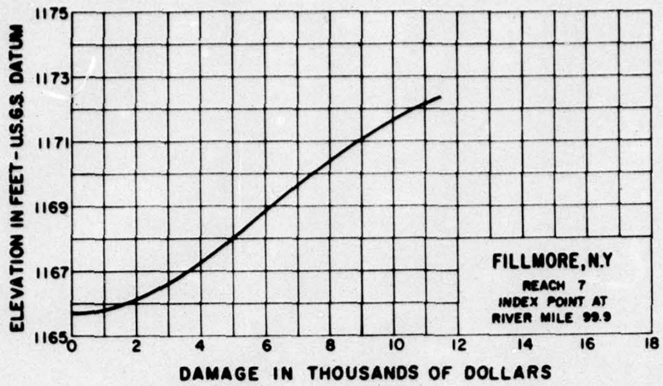
GENESEE RIVER BASIN
COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

STAGE - DAMAGE CURVES
FOR THE GENESEE RIVER

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967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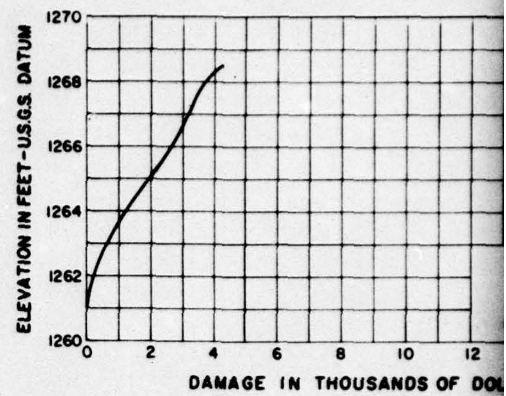
1165
1167
1169
1171
1173
1175
0
2
4
6
8
10
12
14
16
18
DAMAGE IN THOUSANDS OF DOLLARS
FILLMORE, N.Y
REACH 7
INDEX POINT AT
RIVER MILE 99.9


ELEVATION IN FEET - U.S.G.S. DATUM
1260
1262
1264
1266
1268
1270
0
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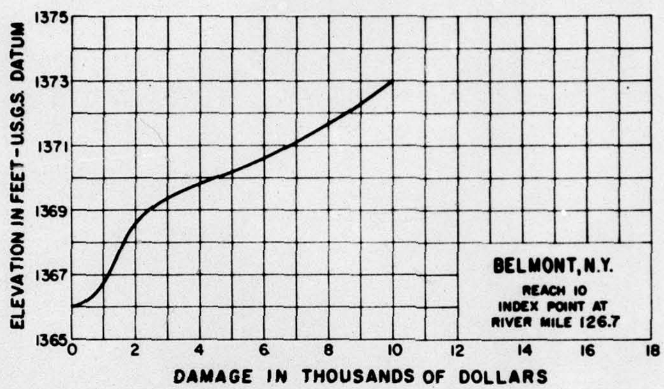
12
DAMAGE IN THOUSANDS OF


ELEVATION IN FEET - U.S.G.S. DATUM
1365
1367
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1371
1373
1375
0
2
4
6
8
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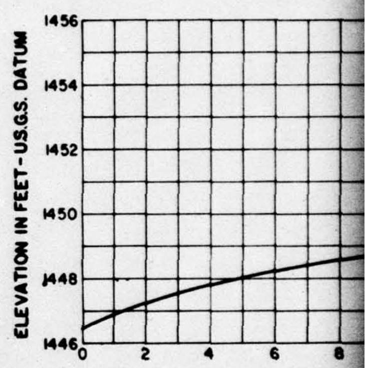
12
14
16
18
DAMAGE IN THOUSANDS OF DOLLARS
BELMONT, N.Y.
REACH 10
INDEX POINT AT
RIVER MILE 126.7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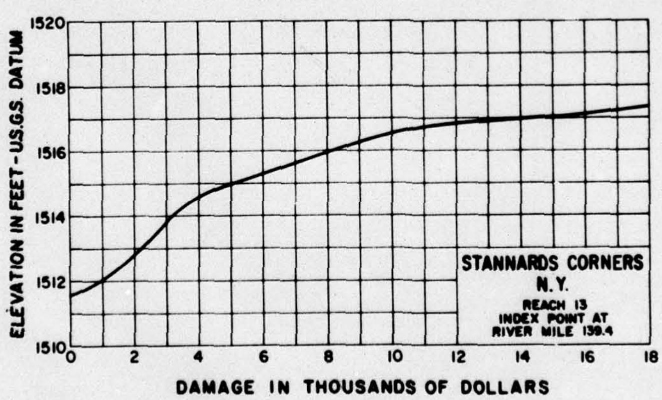
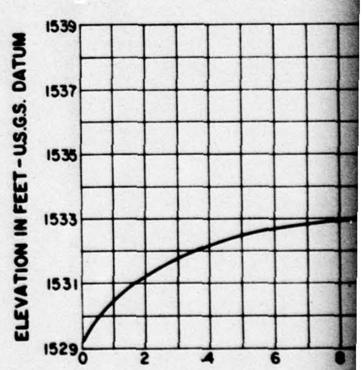
1450
1452
1454
1456
0
2
4
6
8


ELEVATION IN FEET - U.S.G.S. DATUM
1510
1512
1514
1516
1518
1520
0
2
4
6
8
10
12
14
16
18
DAMAGE IN THOUSANDS OF DOLLARS
STANNARDS CORNERS
N.Y.
REACH 13
INDEX POINT AT
RIVER MILE 139.4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1537
1539
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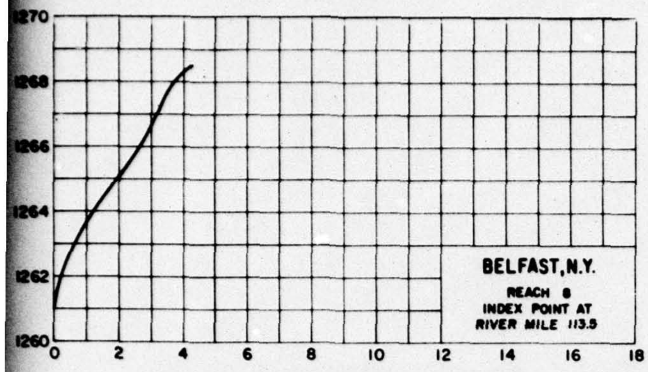
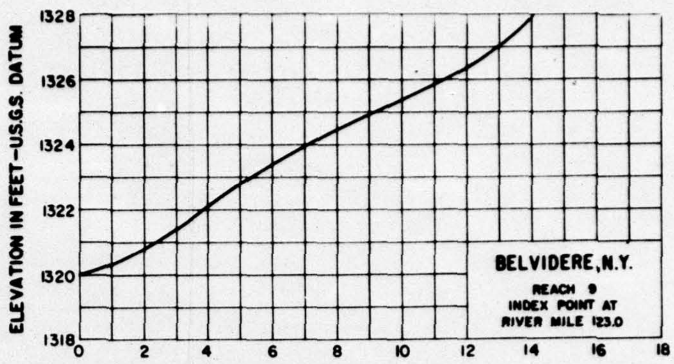
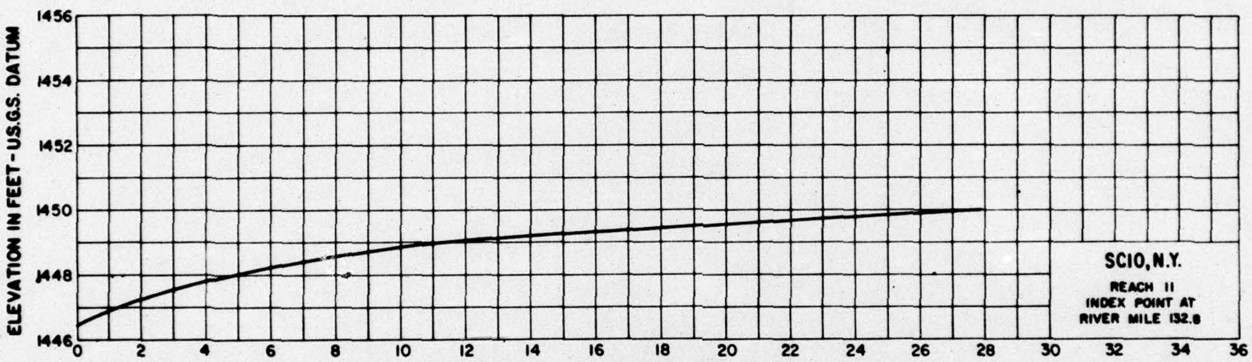
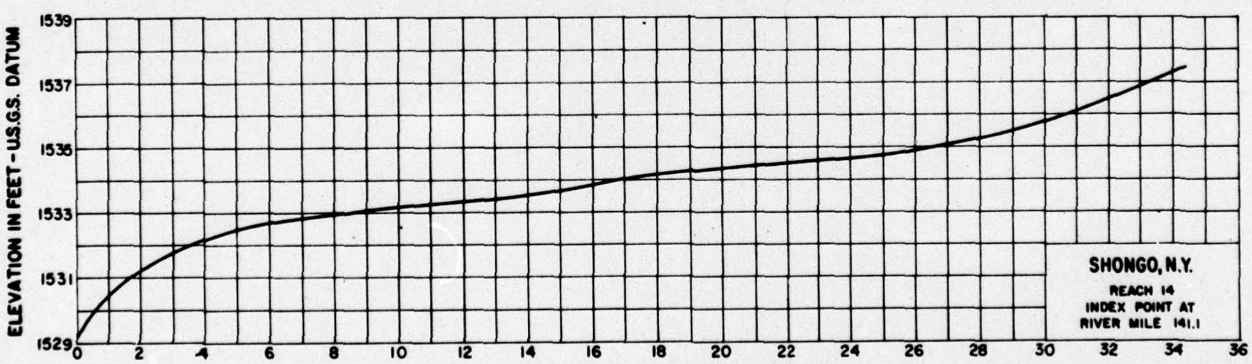








NOTES:

ALL VALUES SHOWN ARE ON THE AUGUST 1964 PRICE LEVEL AND DEVELOPMENT.

CURVES FOR REACH 12 MAY BE FOUND ON PLATES F3A AND F4A

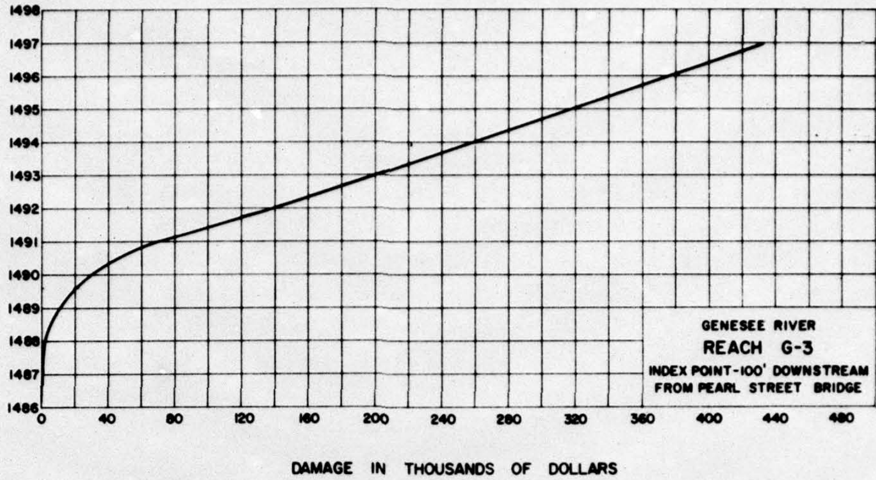
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

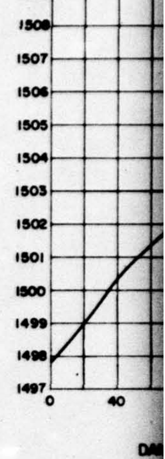
STAGE-DAMAGE CURVES FOR THE UPPER GENESEE RIVER

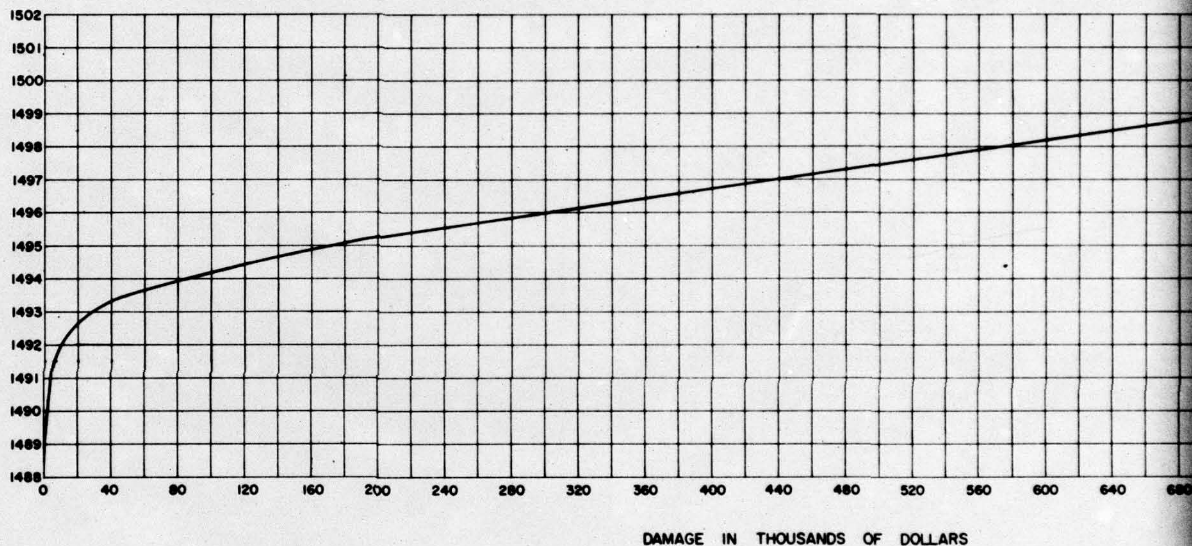
U.S. ARMY ENGINEER DISTRICT, BUFFALO

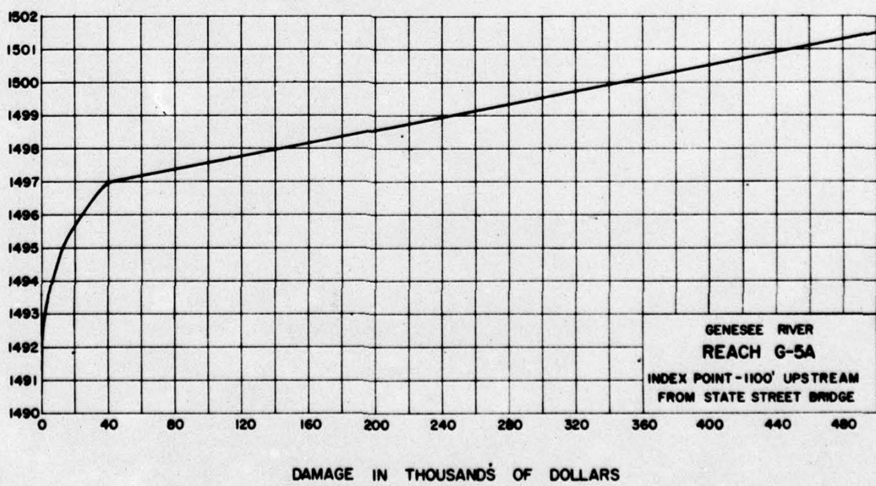
JUNE 1967

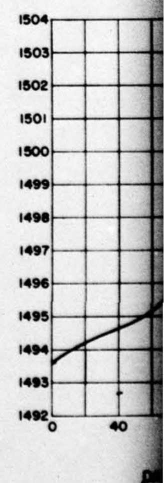
ELEVATION IN FEET U.S.C.G.S. DATUM











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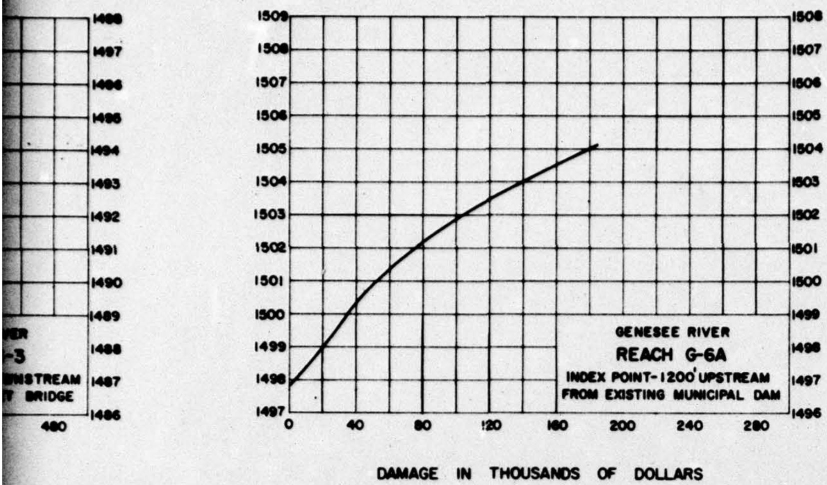
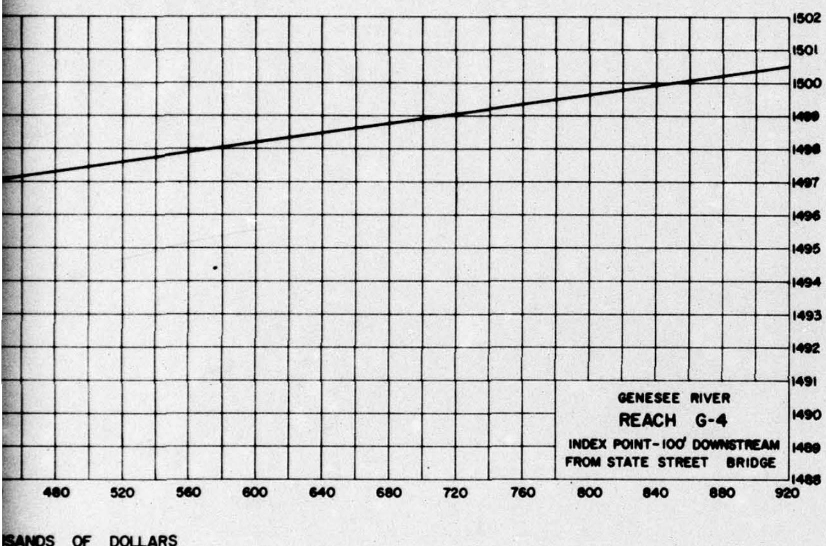
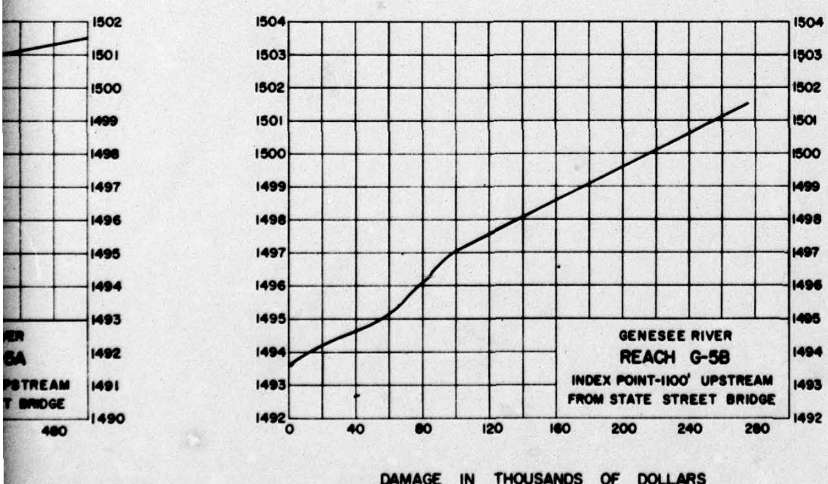




NOTE:

ALL VALUES SHOWN ARE ON THE APRIL 1964 PRICE LEVEL AND DEVELOPMENT.

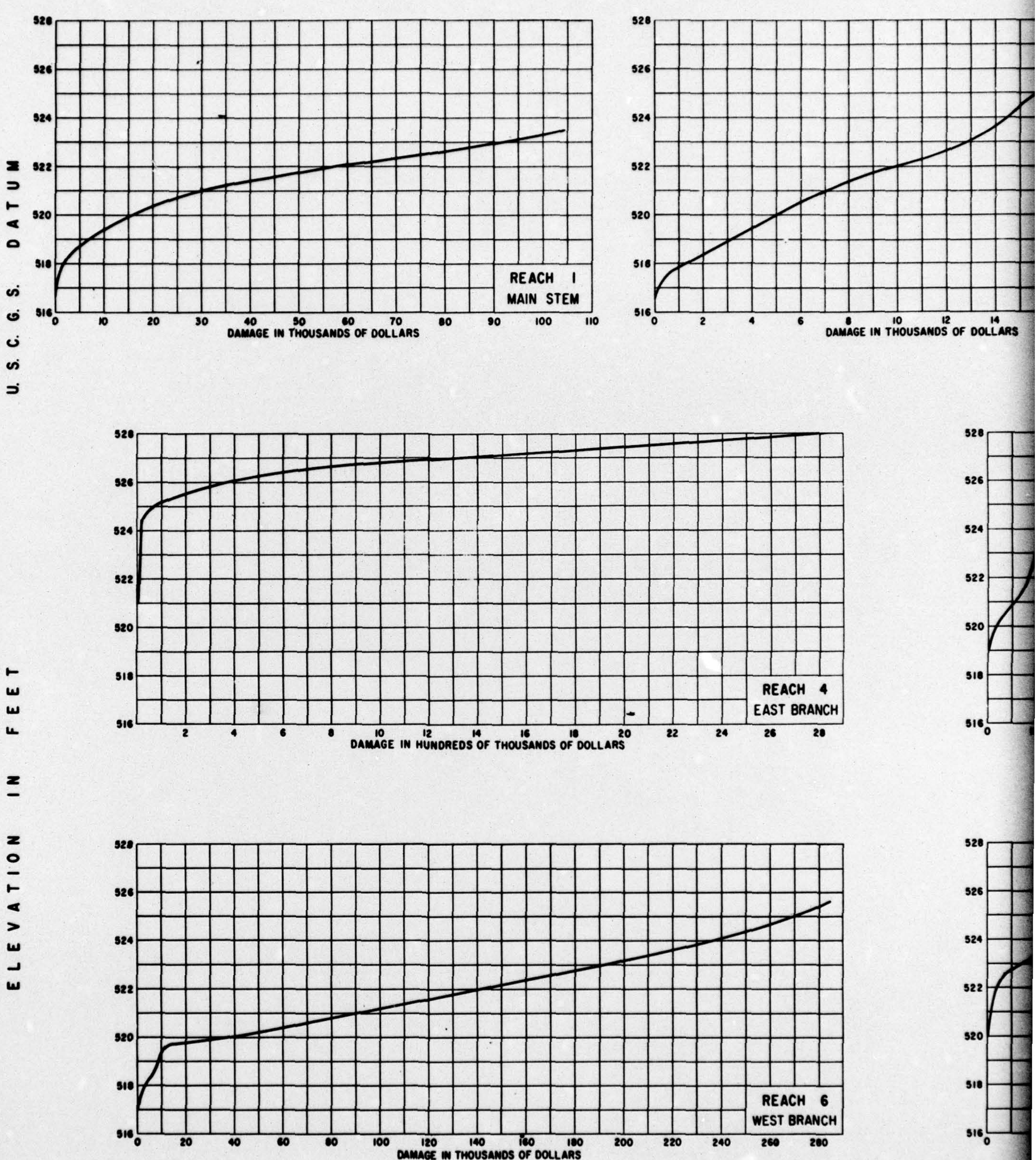


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

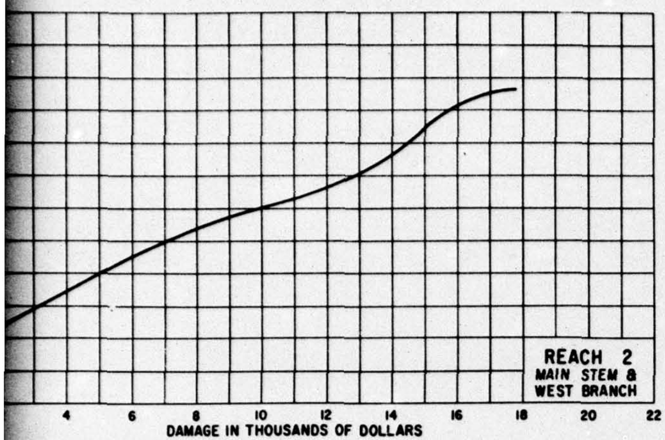
STAGE-DAMAGE CURVES
GENESEE RIVER

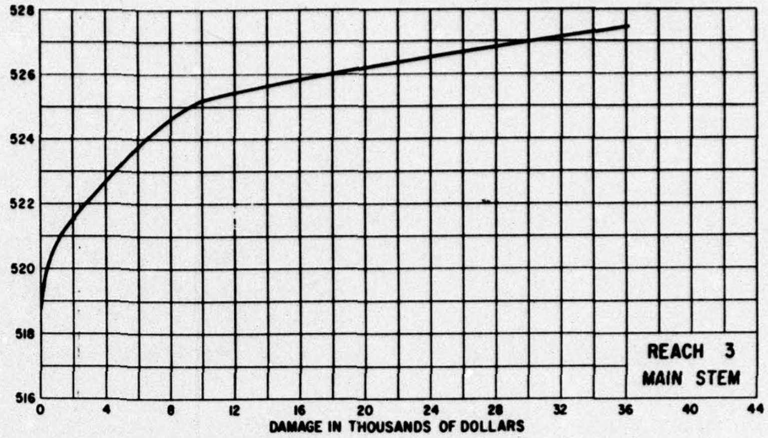
U.S. ARMY ENGINEER DISTRICT, BUFFALO

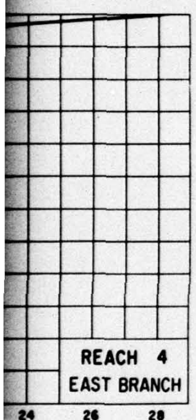
JUNE 1967

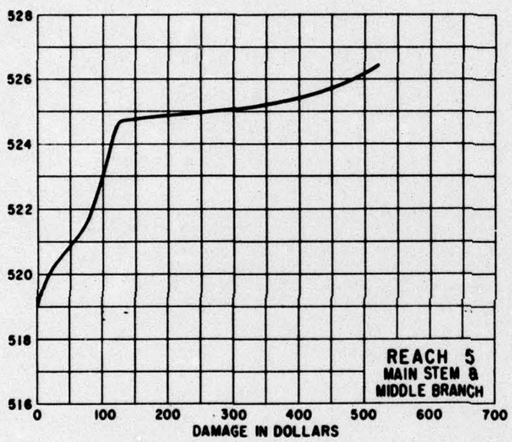

ELEVATION IN FEET U. S. C. G. S. DATUM
REACH 1
MAIN STEM
DAMAGE IN THOUSANDS OF DOLLARS
DAMAGE IN THOUSANDS OF DOLLARS
REACH 4
EAST BRANCH
DAMAGE IN HUNDREDS OF THOUSANDS OF DOLLARS
REACH 6
WEST BRANCH
DAMAGE IN THOUSANDS OF DOLLARS

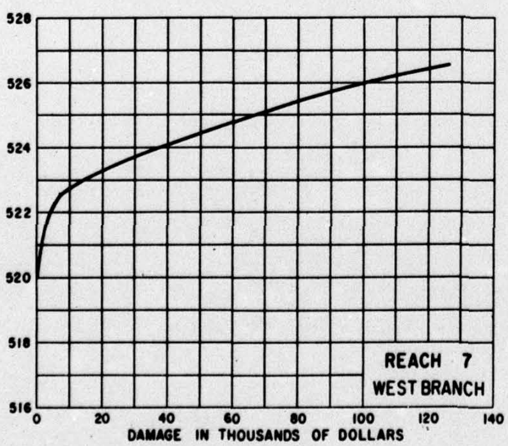
2











NOTES

INDEX · POINT LOCATIONS

REACH 1 - UPSTREAM OF EAST RIVER ROAD - MAIN STEM.

REACH 2 - 1,200 FT. DOWNSTREAM FROM CRITTENDEN ROAD - WEST BRANCH.

REACH 3 - 1,600 FT. UPSTREAM FROM CRITTENDEN ROAD - MAIN STEM.

REACH 4 - DOWNSTREAM OF WEST HENRIETTA ROAD, U.S. RT. 15 - EAST BRANCH.

REACH 5 - 1,800 FT. UPSTREAM FROM THE ERIE LACKAWANNA RR. - MAIN STEM.

REACH 6 - UPSTREAM OF CRITTENDEN ROAD - WEST BRANCH.

REACH 7 - UPSTREAM OF N.Y.S. RT. 252 - WEST BRANCH.

ALL VALUES ARE ON THE MAY 1962 PRICE LEVEL AND CONDITIONS OF DEVELOPMENT AT THE TIME OF THE DAMAGE SURVEY.

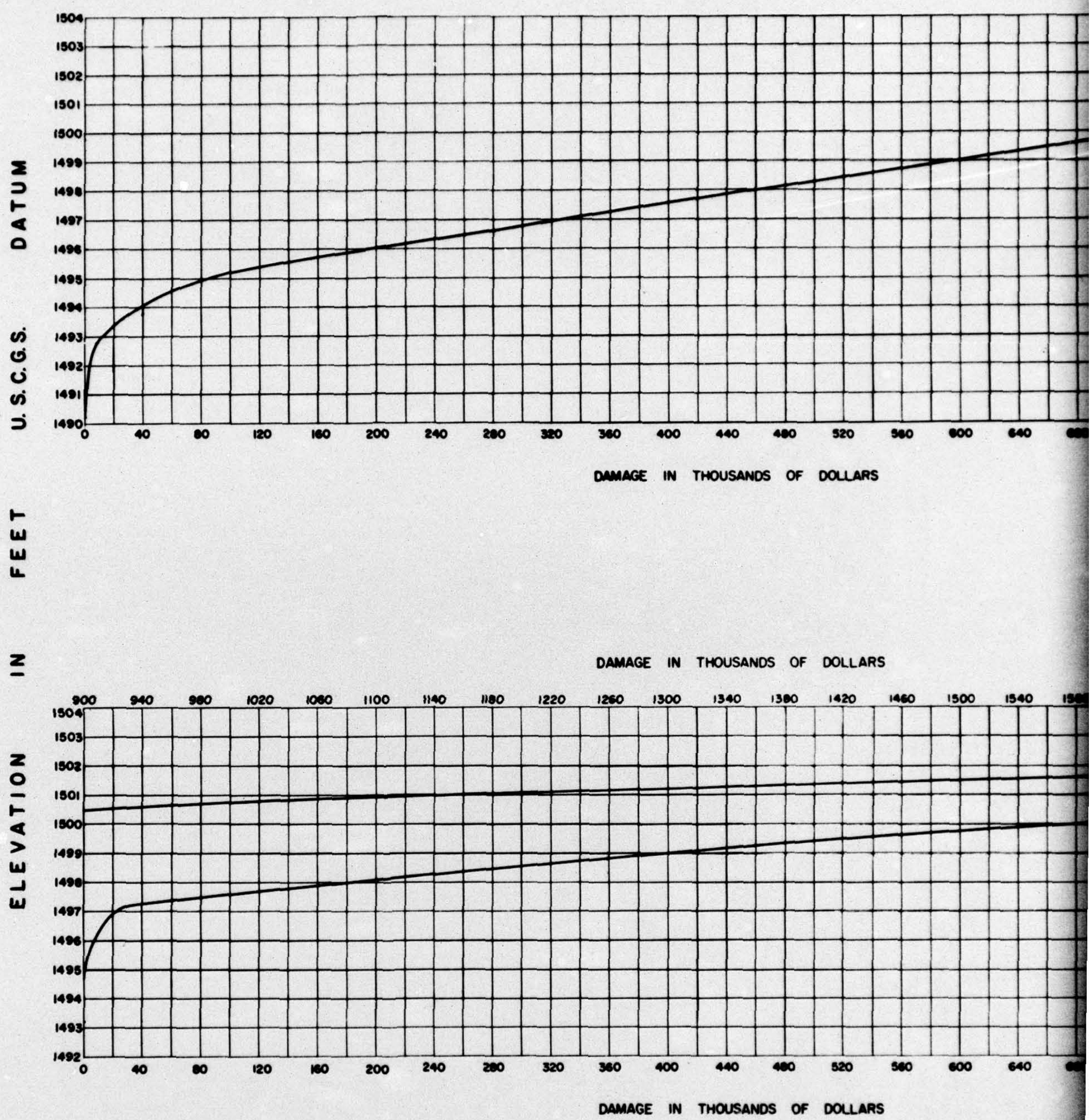
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STAGE-DAMAGE CURVES
RED CREEK

U. S. ARMY ENGINEER DISTRICT, BUFFALO

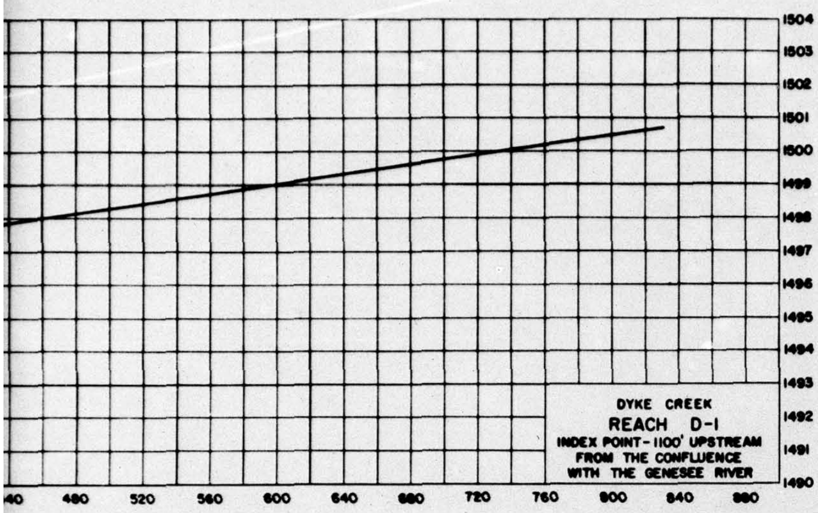
JUNE 1967

PLATE F4A

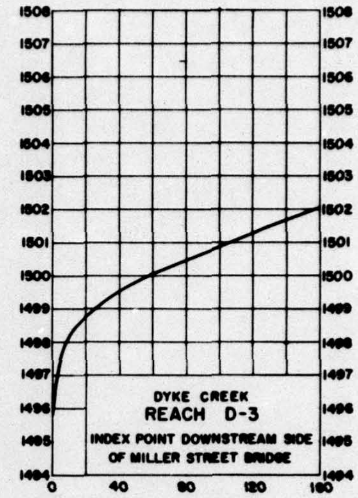


NOTE:

ALL VAL
AND DEVEL

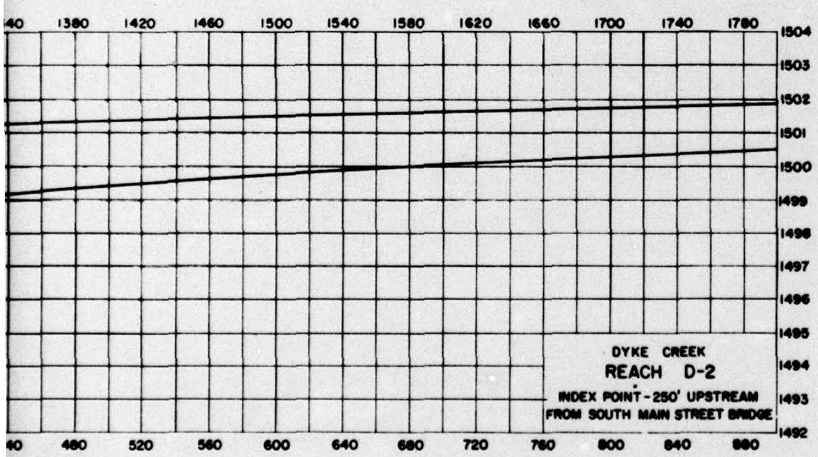


USANDS OF DOLLARS

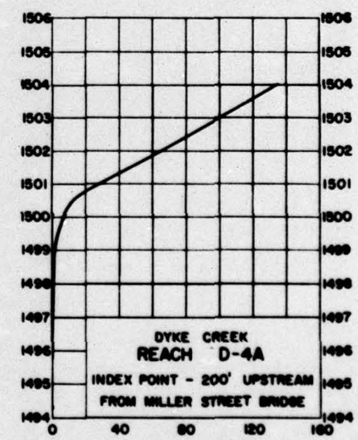


DAMAGE IN THOUSANDS OF DOLLARS

USANDS OF DOLLARS



USANDS OF DOLLARS



DAMAGE IN THOUSANDS OF DOLLARS

NOTE:

ALL VALUES SHOWN ARE ON THE APRIL 1964 PRICE LEVEL AND DEVELOPMENT.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY

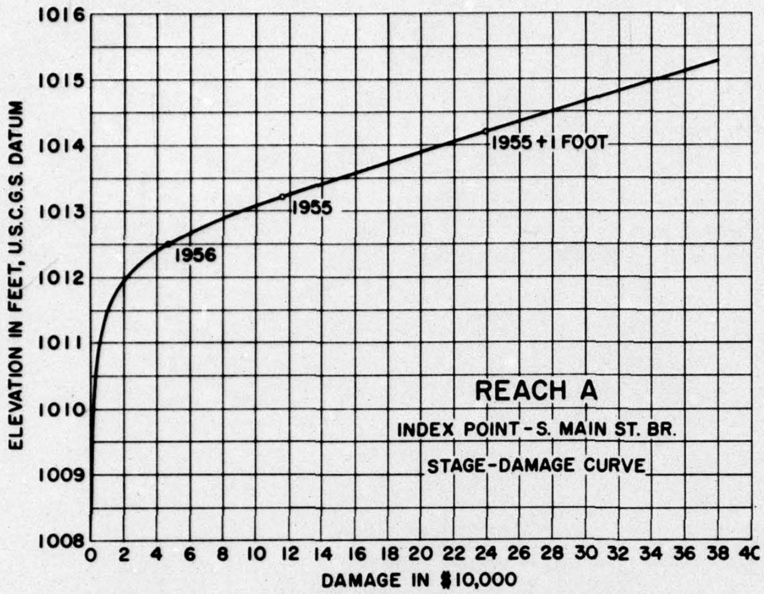
NEW YORK AND PENNSYLVANIA

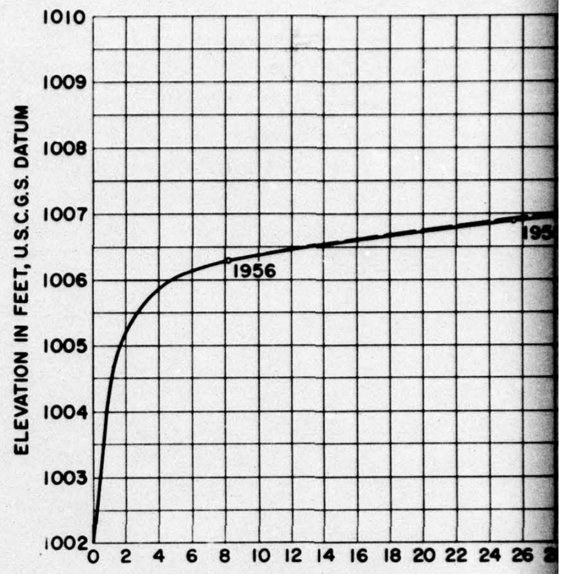
STAGE-DAMAGE CURVES
DYKE CREEK

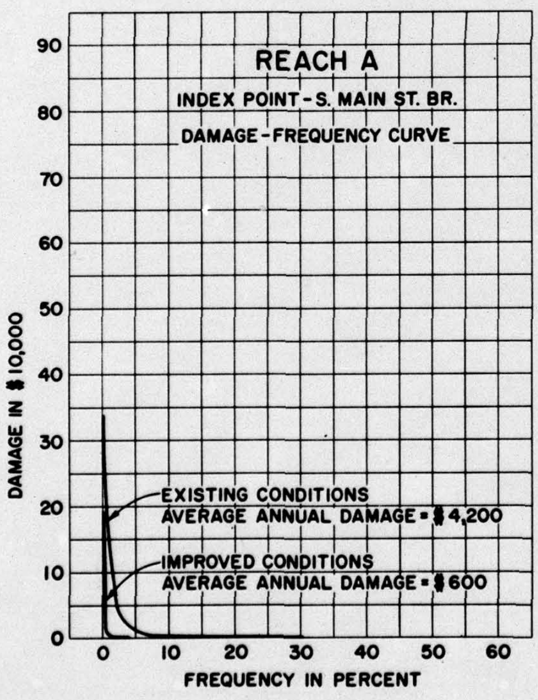
U. S. ARMY ENGINEER DISTRICT, BUFFALO

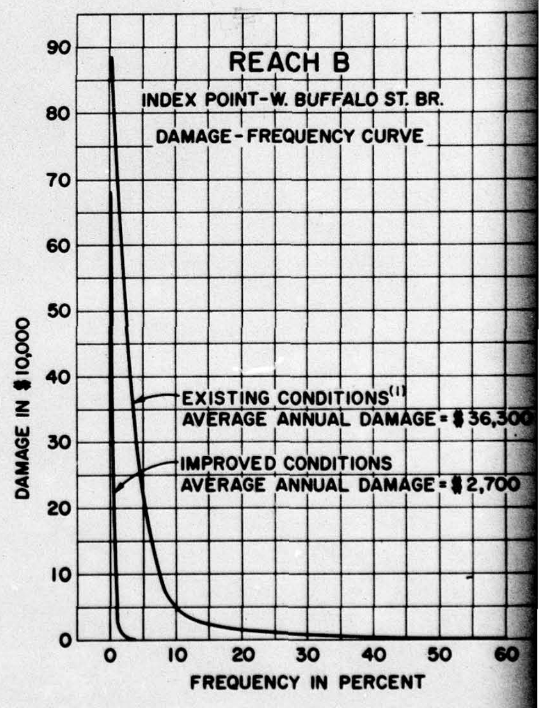
JUNE 1967

PLATE F 5A

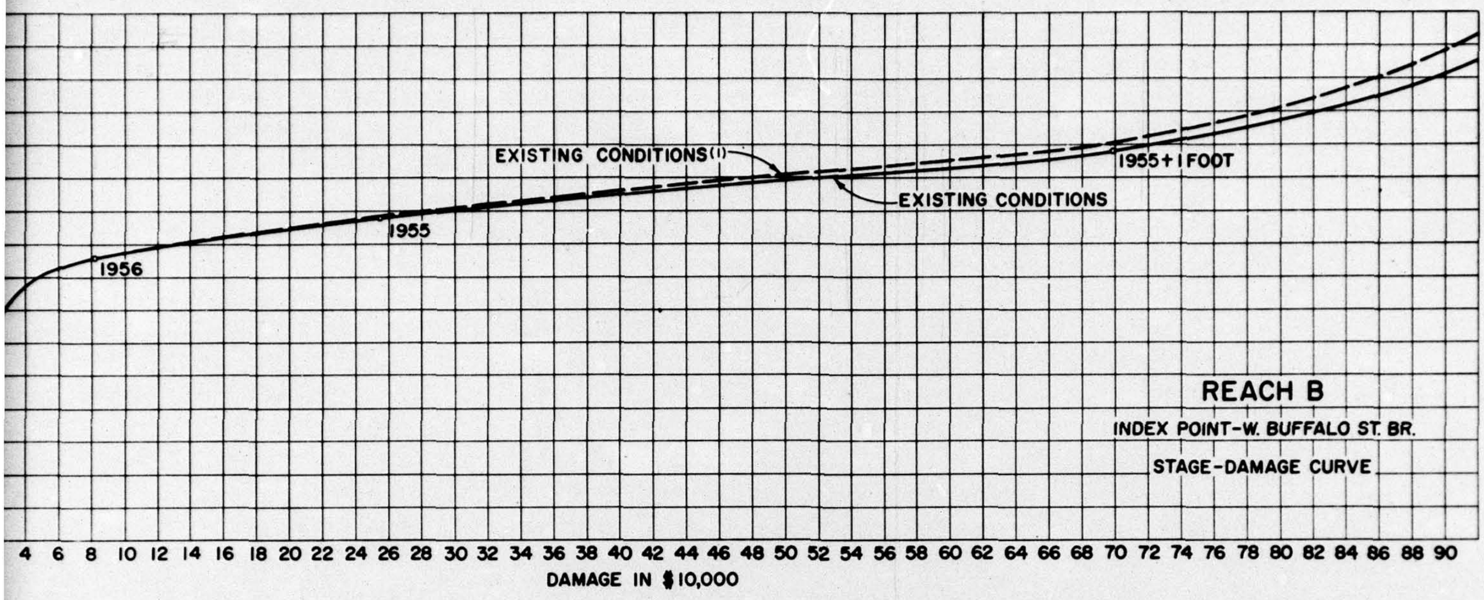

REACH A
INDEX POINT - S. MAIN ST. BR.
STAGE-DAMAGE CURVE
ELEVATION IN FEET, U.S.C.G.S. DATUM
DAMAGE IN $10,000
1955 + 1 FOOT
1955
1956

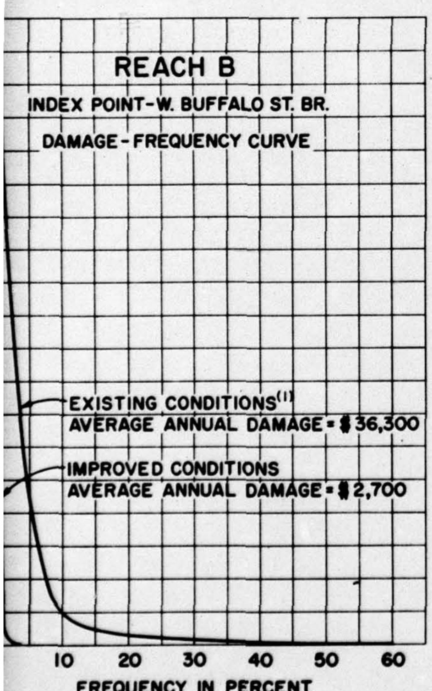

ELEVATION IN FEET, U.S.C.G.S. DATUM
1956


REACH A
INDEX POINT - S. MAIN ST. BR.
DAMAGE-FREQUENCY CURVE
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGE = $4,200
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGE = $600
DAMAGE IN $10,000
FREQUENCY IN PERCENT


REACH B
INDEX POINT - W. BUFFALO ST. BR.
DAMAGE-FREQUENCY CURVE
EXISTING CONDITIONS(1)
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGE = $2,700
DAMAGE IN $10,000
FREQUENCY IN PERCENT

2





LEGEND

1955 .... STAGE AND ESTIMATED DAMAGE FROM INDICATED FLOOD.

1955 + 1 FOOT . . ESTIMATED DAMAGE FOR FLOOD 1 FOOT HIGHER THAN 1955 FLOOD.

NOTE

ALL VALUES SHOWN ARE ON THE JAN. 1962 PRICE LEVEL AND 1961 CONDITIONS OF DEVELOPMENT.

(1) REFLECTS RECURRING DAMAGE AFTER REMOVAL OF STRUCTURES WITHIN RIGHT OF WAY OF IMPROVEMENT.

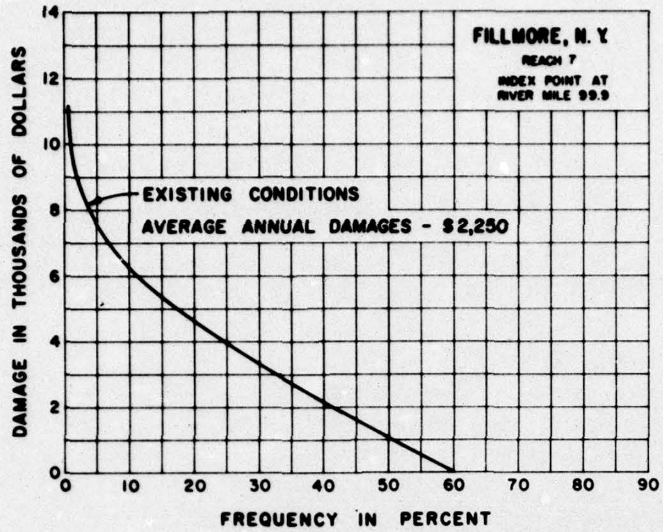
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

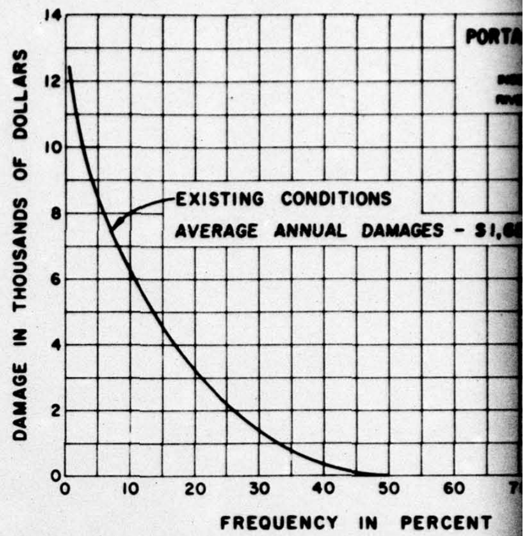
STAGE-DAMAGE CURVES
OATKA CREEK

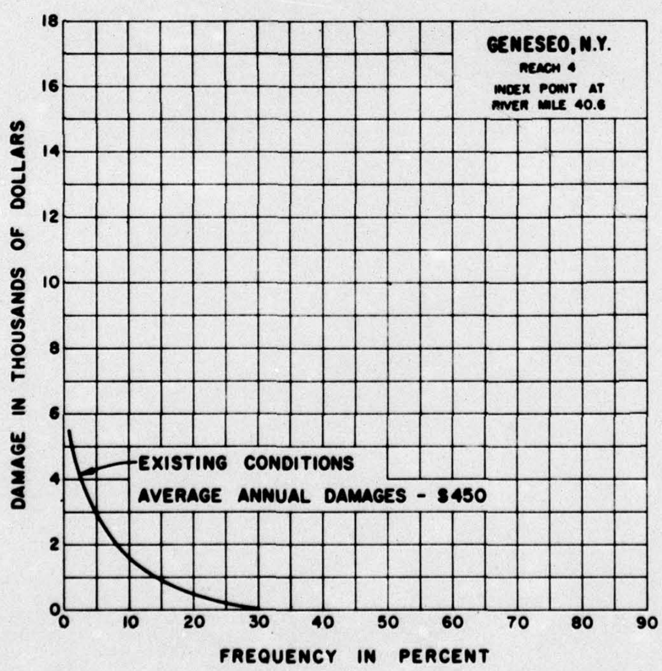
U. S. ARMY ENGINEER DISTRICT, BUFFALO

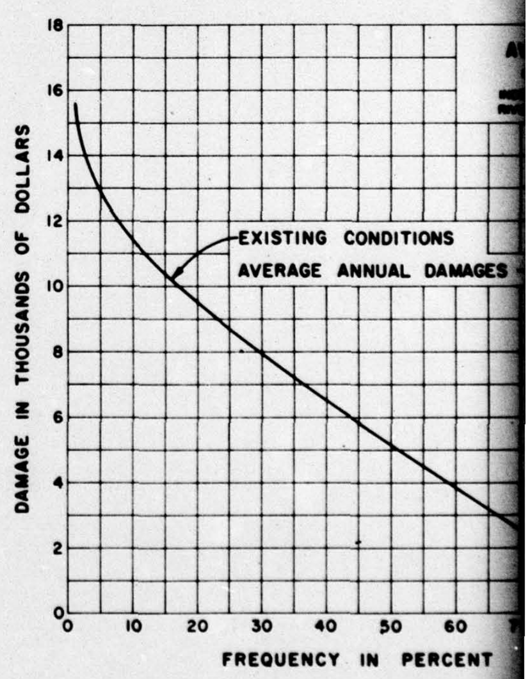
JUNE 1967

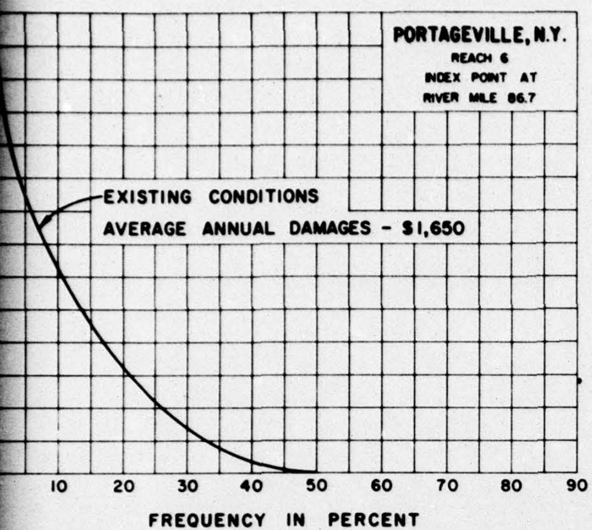
PLATE F 6A

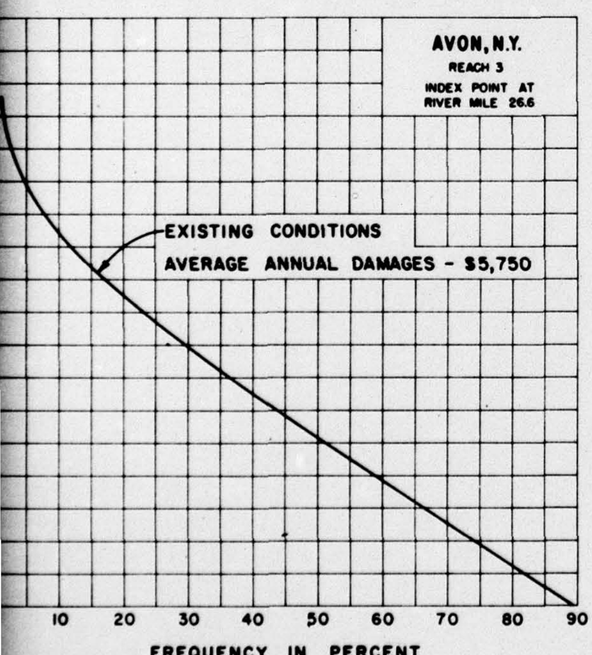

FILLMORE, N.Y.
REACH 7
INDEX POINT AT
RIVER MILE 99.9
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $2,250
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

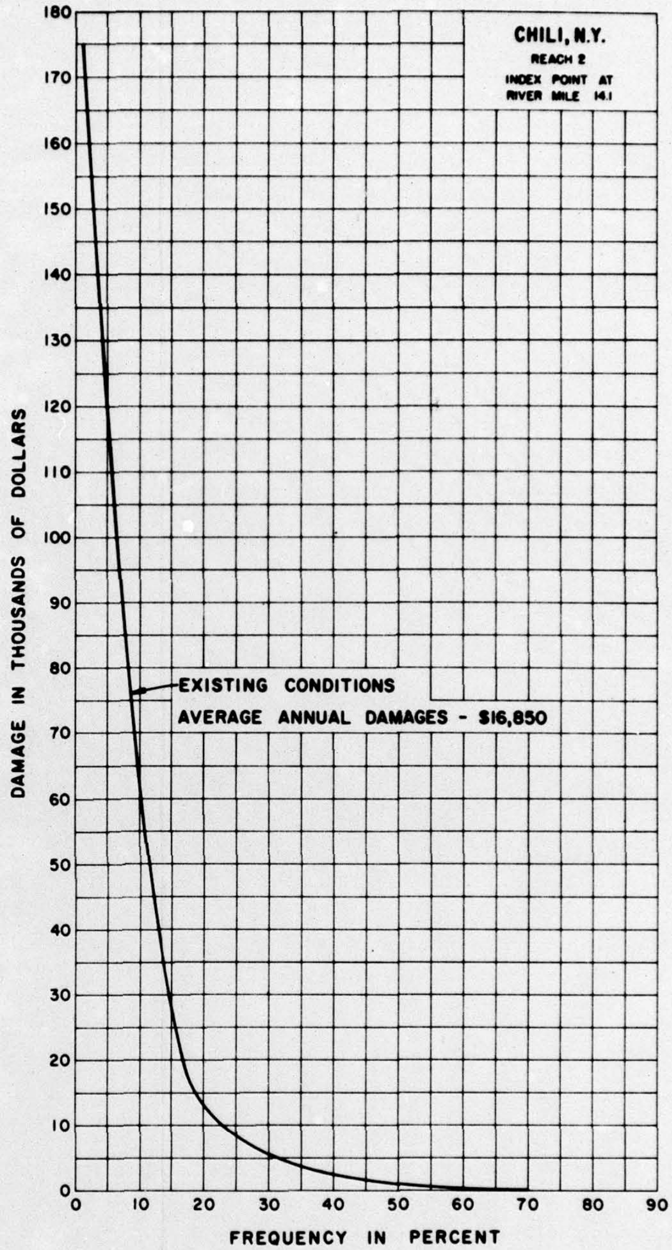

EXISTING CONDITIONS
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT


GENESEO, N.Y.
REACH 4
INDEX POINT AT
RIVER MILE 40.6
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $450
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT


EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT







NOTES:

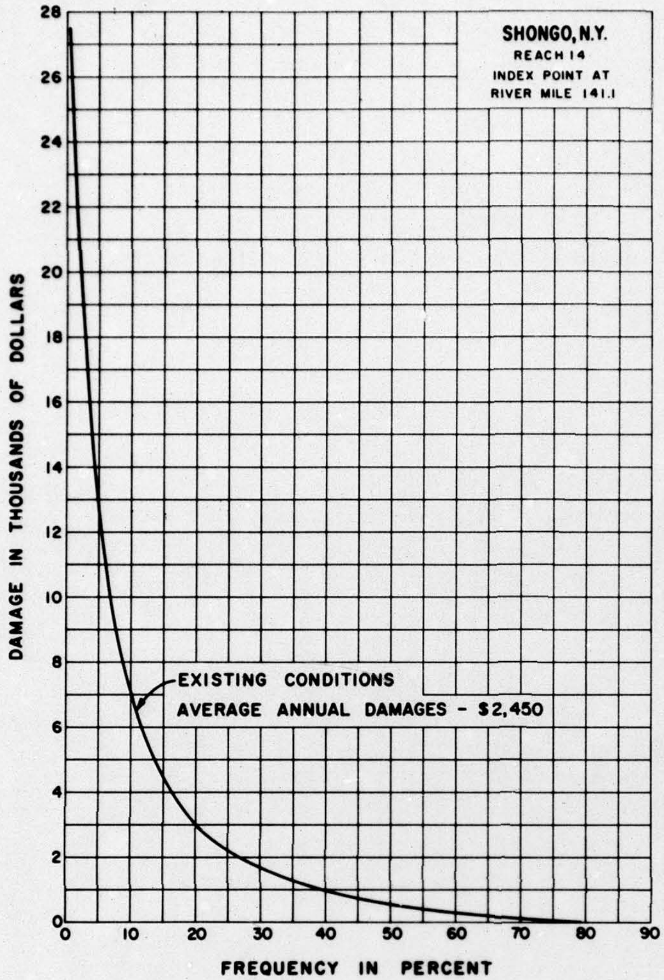
ALL VALUES SHOWN ARE ON THE AUGUST 1964 PRICE LEVEL AND DEVELOPMENT.

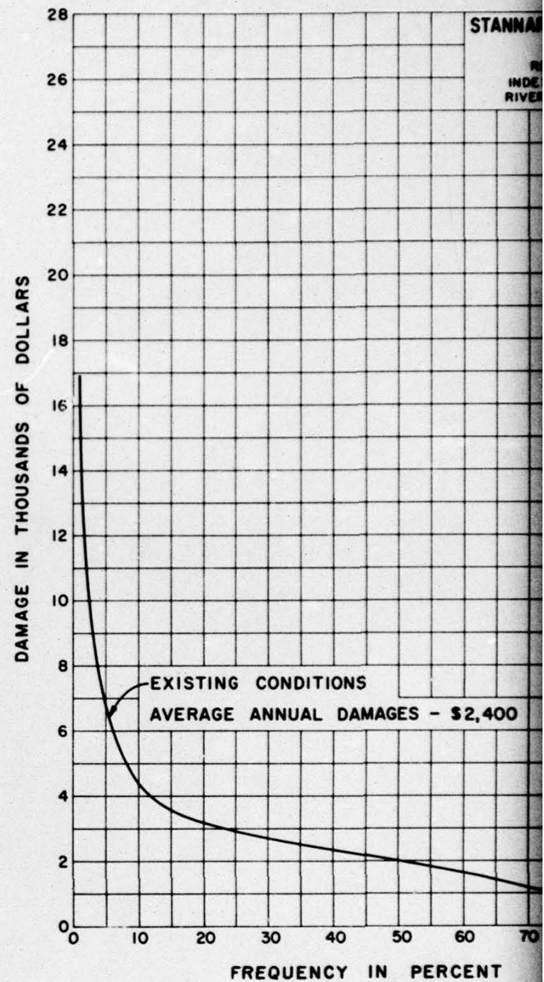
REACH 5 IS LOCATED WITHIN LETCHWORTH STATE PARK AND HAS NO SIGNIFICANT DAMAGE.

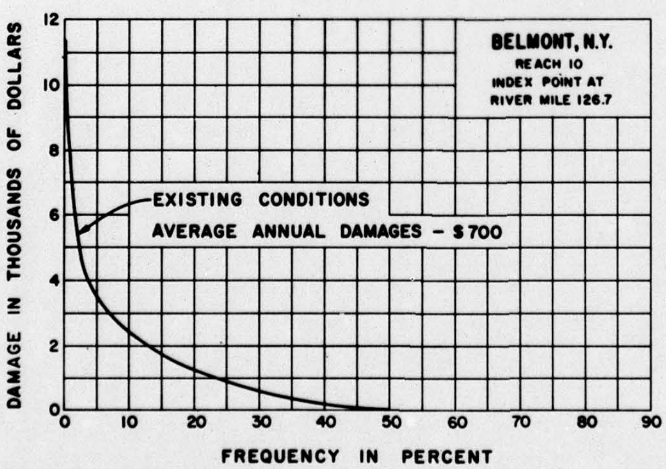
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

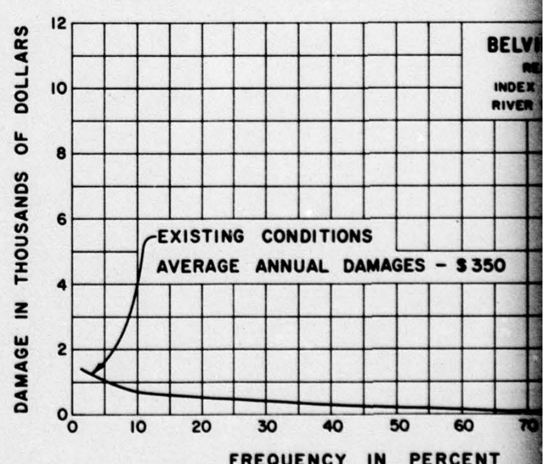
DAMAGE-FREQUENCY CURVES FOR THE GENESEE RIVER

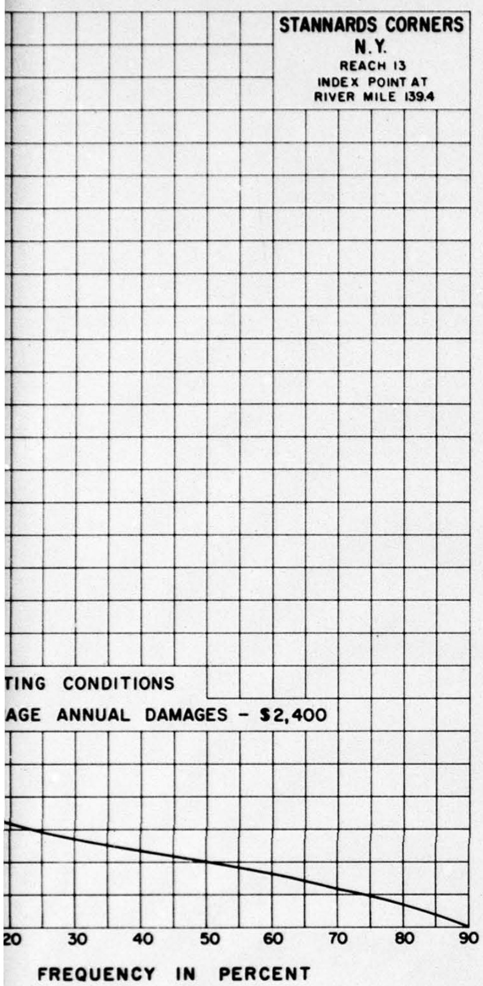
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

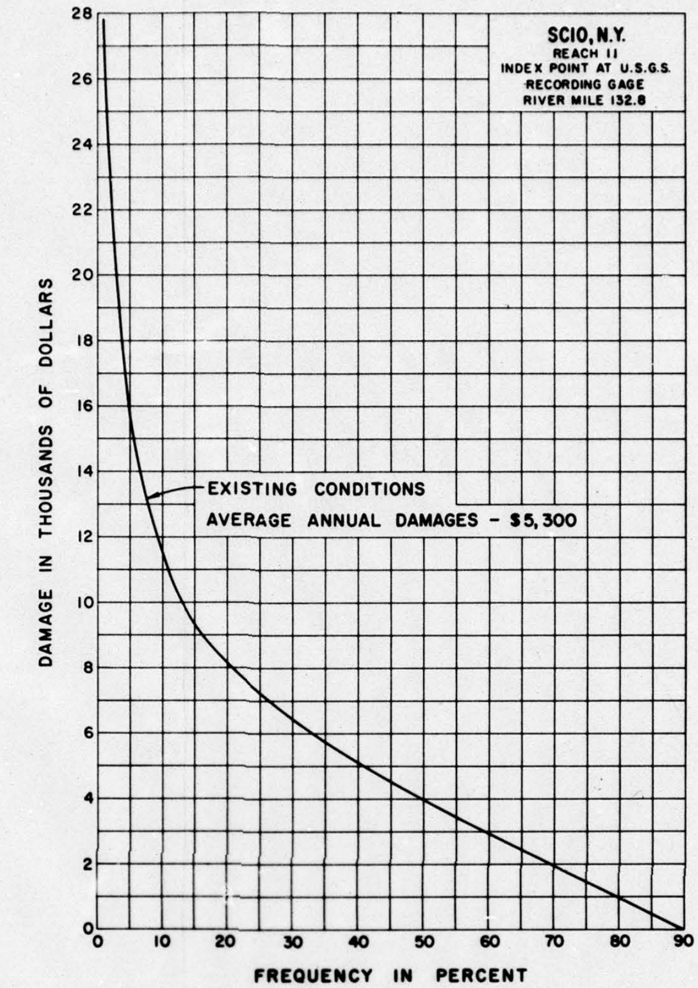

SHONGO, N.Y.
REACH 14
INDEX POINT AT
RIVER MILE 141.1
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $2,450
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

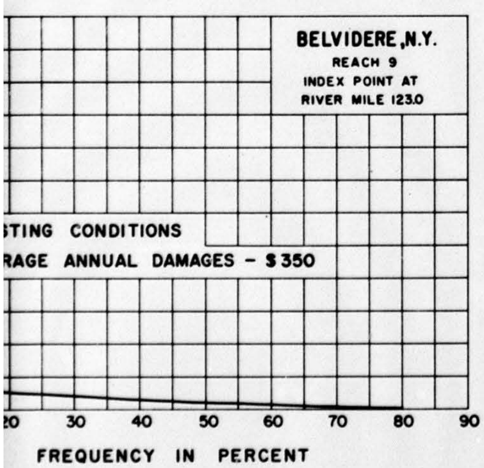

EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $2,400
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

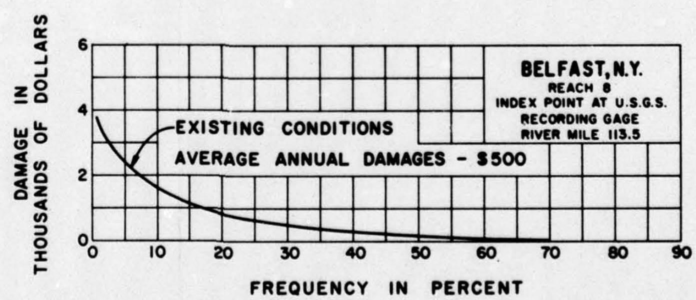

BELMONT, N.Y.
REACH 10
INDEX POINT AT
RIVER MILE 126.7
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $700
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT


EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $350
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT









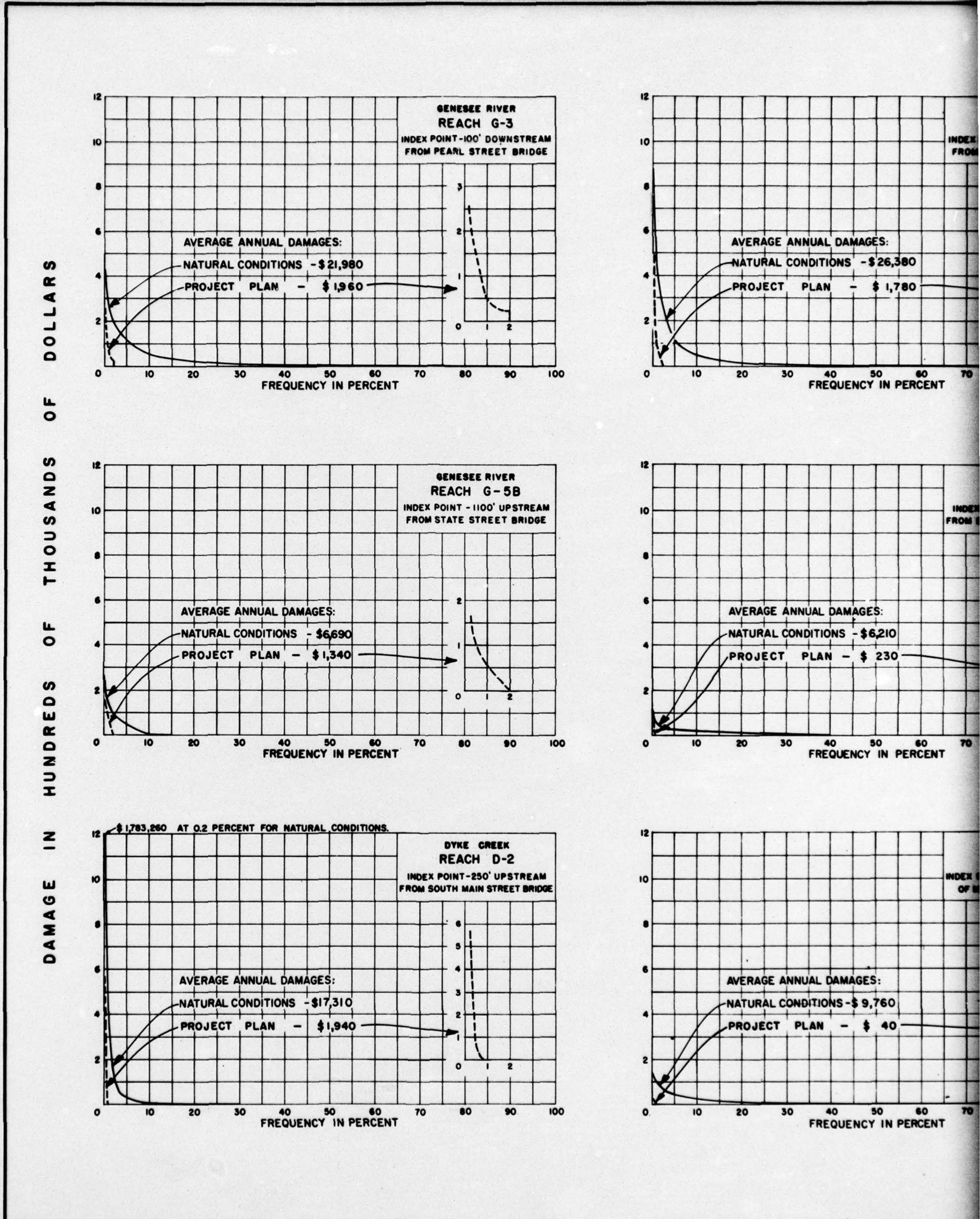
NOTE:
ALL VALUES SHOWN ARE ON THE AUGUST 1964 PRICE LEVEL.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

DAMAGE-FREQUENCY CURVES FOR THE UPPER GENESEE RIVER

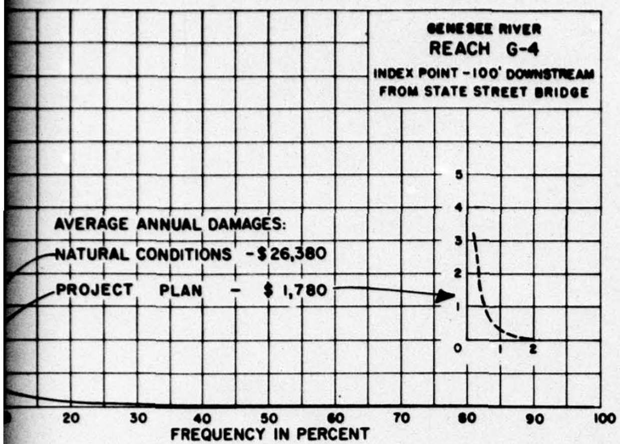
U.S. ARMY ENGINEER DISTRICT, BUFFALO

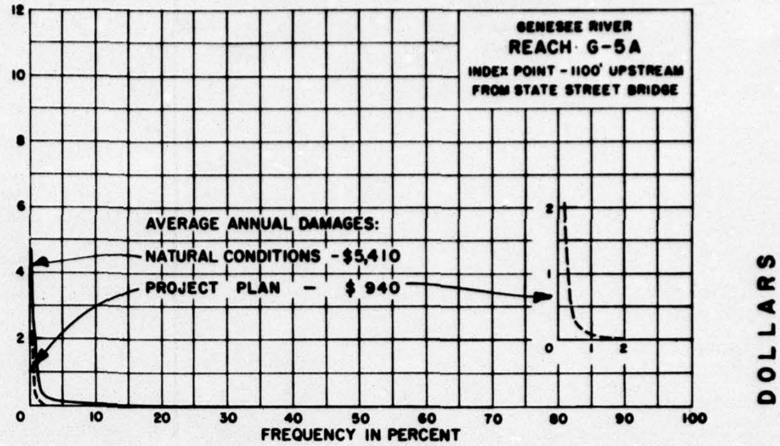
JUNE 1967

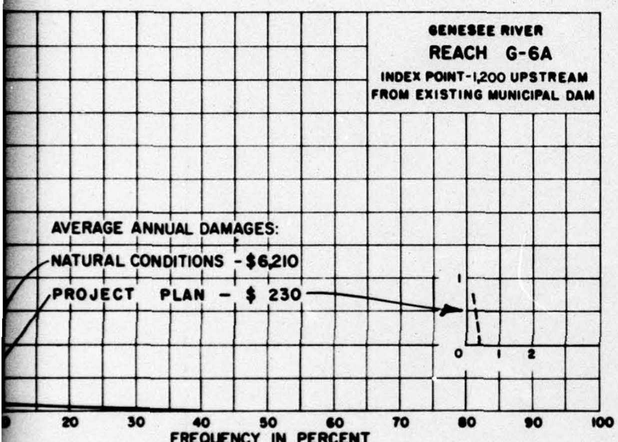


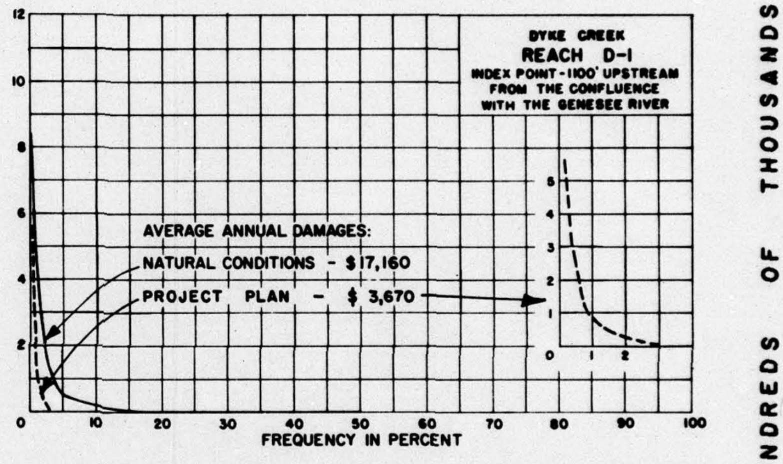
DAMAGE IN HUNDREDS OF THOUSANDS OF DOLLARS
GENESEE RIVER
REACH G-3
INDEX POINT-100' DOWNSTREAM FROM PEARL STREET BRIDGE
AVERAGE ANNUAL DAMAGES:
NATURAL CONDITIONS -$21,980
PROJECT PLAN - $1,960
FREQUENCY IN PERCENT
AVERAGE ANNUAL DAMAGES:
NATURAL CONDITIONS -$26,380
PROJECT PLAN - $1,780
FREQUENCY IN PERCENT
GENESEE RIVER
REACH G-5B
INDEX POINT - 1100' UPSTREAM FROM STATE STREET BRIDGE
AVERAGE ANNUAL DAMAGES:
NATURAL CONDITIONS - $6,690
PROJECT PLAN - $1,340
FREQUENCY IN PERCENT
AVERAGE ANNUAL DAMAGES:
NATURAL CONDITIONS -$6,210
PROJECT PLAN - $ 230
FREQUENCY IN PERCENT
$1,783,260 AT 0.2 PERCENT FOR NATURAL CONDITIONS.
DYKE CREEK
REACH D-2
INDEX POINT-250' UPSTREAM FROM SOUTH MAIN STREET BRIDGE
AVERAGE ANNUAL DAMAGES:
NATURAL CONDITIONS -$17,310
PROJECT PLAN - $1,940
FREQUENCY IN PERCENT
AVERAGE ANNUAL DAMAGES:
NATURAL CONDITIONS -$ 9,760
PROJECT PLAN - $ 40
FREQUENCY IN PERCENT

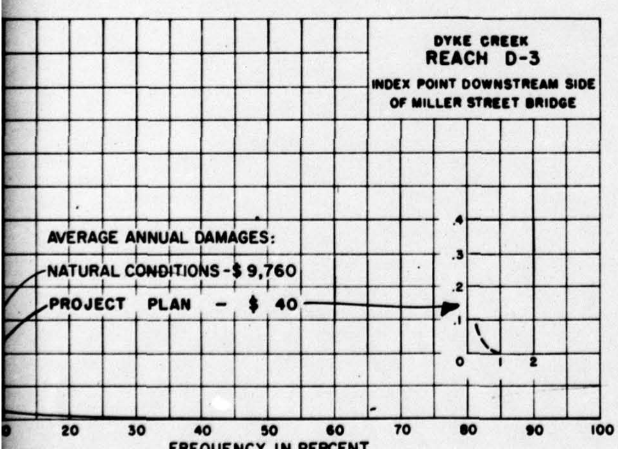
2

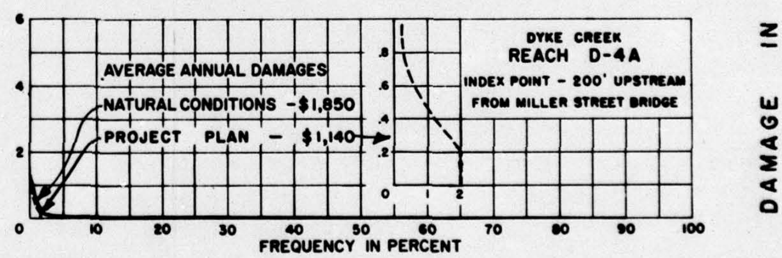












NOTES:

ALL VALUES SHOWN ARE ON THE APRIL 1964 PRICE LEVEL AND DEVELOPMENT.

DAMAGE FREQUENCY CURVES HAVE BEEN DRAWN TO ONLY 0.2 PERCENT CHANCE OF OCCURRENCE.

ALL VALUES SHOWN UNDER PROJECT PLAN CONDITIONS ARE BASED ON THE ASSUMPTION THAT THERE WILL BE NO HIGHWAY RELOCATIONS.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

DAMAGE-FREQUENCY CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967